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ABSTRACT

This yearbook consists of 14 articles dealing with the contributions of industrial arts to selected areas of education. Included among the articles presented are the following: "Industrial Arts and Its Contribution to the Education of the Elementary School Child," by Michael J. Williams; "Industrial Arts and Its Contribution in Assisting the Student with Developmental Tasks," by Donald Maley; "Industrial Arts and Its Contribution to the Education of the Gifted," by G. Eugene Martin; "Industrial Arts and Its Contribution to the Education of the Disadvantaged," by Merrill M. Oaks and Muriel K. Oaks; "Industrial Arts and Its Contribution to the Education of the Handicapped," by Michael Bender; "Industrial Arts and Its Contribution to Career Education," by Donald F. Smith; "Industrial Arts and Its Contribution to Vocational Education," by Nevin R. Frantz, Jr.; "Industrial Arts and Its Contribution to the Guidance of Youth," by Walter S. Mietus; "Industrial Arts and Its Contribution to the Improvement of Reading," by Frank Walton; "Industrial Arts and Its Contribution in Assisting the Student in Language Arts Development," by Perry R. Genmill; "Industrial Arts and Its Contribution to Economic Education" by R. Thomas Wright; and "Industrial Arts and Its Contribution to Consumer Education," by Rollin Williams, III. (MN)

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THE CONTRIBUTIONS OF INDUSTRIAL ARTS TO SELECTED AREAS OF EDUCATION

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31st Yearbook, 1982

American Council on Industrial Arts Teacher Education

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Foreword

Industrial arts is perceived within the profession as meeting many different educational outcomes. How we are viewed by those outside the profession appears to generate even more diversity of purpose and worth.

This 1982 "Yearbook 31" has taken on the challenge of speaking succinctly to the school superintendent, principal, other school officials and the lay public about the contributions of industrial arts in selected areas. This is a formidable task, yet one that has been long overdue in being accomplished. Each chapter addresses the identified issue, examines the circumstances and problems associated with it, looks to the literature, and then clearly zeros in on the contribution itself. It is a landmark approach involving the yearbook series.

The American Council on Industrial Arts Teacher Education is grateful to the editors, Donald Maley and Kendall N. Starkweather, for their vision, leadership, and hard work in bringing this yearbook to fruition. The chapter authors are also to be commended for their systematic and thorough treatment of their contributions. This yearbook is indeed welcome to the literature of the profession and will be a significant boost to the continued growth and development of the field.

The Council is also most appreciative to the McKnight Publishing Company for their long and faithful support of the ACIATE Yearbook Series.

M. James Bensen
President ACIATE

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Yearbook Proposals

Each year, at the AIAA international conference, the ACIATE Yearbook Committee reviews the progress of yearbooks in preparation and evaluates proposals for additional yearbooks. Any member is welcome to submit a yearbook proposal. It should be written in sufficient detail for the committee to be able to understand the proposed substance and format, and sent to the committee chairman by February 1 of the year in which the conference is held. Below are the criteria employed by the committee in making yearbook selections.

ACIATE Yearbook Committee

Guidelines for ACIATE Yearbook Topic Selection

With reference to a specific topic:

1. It should make a direct contribution to the understanding and the improvement of industrial arts teacher education.
2. It should avoid duplication of the publications activities of other professional groups.
3. It should confine its content to professional education subject matter of a kind that does not infringe upon the area of textbook publication which treats a specific body of subject matter in a structured, formal way.
4. It should not be exploited as an opportunity to promote and publicize one man's or one institution's philosophy unless the volume includes other similar efforts that have enjoyed some degree of popularity and acceptance in the profession.
5. While it may encourage and extend what is generally accepted as good in existing theory and practice, it should also actively and constantly seek to upgrade and modernize professional action in the area of industrial arts teacher education.
6. It can raise controversial questions in an effort to get a national hearing and as a prelude to achieving something approaching a national consensus.
7. It may consider as available for discussion and criticism any ideas of individuals or organizations that have gained some degree of acceptance as a result of dissemination either through formal publication, through oral presentation, or both.
8. It can consider a variety of seemingly conflicting trends and statements emanating from a variety of sources and motives, analyze them, consolidate and thus seek out and delineate key problems to enable the profession to make a more concerted effort at finding a solution.

Approved, Yearbook Planning Committee
March 15, 1967, Philadelphia, PA.

Previously Published Yearbooks

*1. *Inventory Analysis of Industrial Arts Teacher Education Facilities, Personnel and Programs*, 1952.
*2. *Who's Who in Industrial Arts Teacher Education*, 1953.
*3. *Some Components of Current Leadership; Techniques of Selection and Guidance of Graduate Students; An Analysis of Textbook Emphases;* 1954, three studies.
*4. *Superior Practices in Industrial Arts Teacher Education*, 1955.
*5. *Problems and Issues in Industrial Arts Teacher Education*, 1956.
*6. *A Sourcebook of Reading in Education for Use in Industrial Arts and Industrial Arts Teacher Education*, 1957.
*7. *The Accreditation of Industrial Arts Teacher Education*, 1958.
*8. *Planning Industrial Arts Facilities*, 1959. Ralph K. Nair, ed.
*9. *Research in Industrial Arts Education*, 1960. Raymond Van Tassel, ed.
*10. *Graduate Study in Industrial Arts*, 1961. R. P. Norman and R. C. Bohn, eds.
*11. *Essentials of Preservice Preparation*, 1962. Donald G. Lux, ed.
*12. *Action and Thought in Industrial Arts Education*, 1963. E. A. T. Svendsen, ed.
*13. *Classroom Research in Industrial Arts*, 1964. Charles B. Porter, ed.
14. *Approaches and Procedures in Industrial Arts*, 1965. G. S. Wall, ed.
15. *Status of Research in Industrial Arts*, 1966. John D. Rowlett, ed.
16. *Evaluation Guidelines for Contemporary Industrial Arts Programs*, 1967. Lloyd P. Nelson and William T. Sargent, eds.
17. *A Historical Perspective of Industry*, 1968. Joseph F. Luetkemeyer, Jr., ed.
18. *Industrial Technology Education*, 1969. C. Thomas Dean and N. A. Hauer, eds. *Who's Who in Industrial Arts Teacher Education*, 1969. John M. Pollock and Charles A. Bunten, eds.
19. *Industrial Arts for Disadvantaged Youth*, 1970. Ralph O. Gallington, ed.
20. *Components of Teacher Education*, 1971. W. E. Ray and J. Streichler, eds.
21. *Industrial Arts for the Early Adolescent*, 1972. Daniel L. Householder, ed.
*22. *Industrial Arts in Senior High Schools*, 1973. Rutherford E. Lockette, ed.
23. *Industrial Arts for the Elementary School*, 1974. Robert G. Thrower and Robert D. Weber, eds.
24. *A Guide to the Planning of Industrial Arts Facilities*, 1975. D. E. Moon, ed.
25. *Future Alternatives for Industrial Arts*, 1976. Lee H. Smalley, ed.
26. *Competency-Based Industrial Arts Teacher Education*, 1977. Jack C. Brueckman and Stanley E. Brooks, eds.
27. *Industrial Arts in the Open Access Curriculum*, 1978. L. D. Anderson, ed.
28. *Industrial Arts Education: Retrospect, Prospect*, 1979. G. Eugene Martin, ed.
29. *Technology and Society: Interfaces with Industrial Arts*, 1980. Herbert A. Anderson and M. James Bensen, eds.
30. *An Interpretive History of Industrial Arts*, 1981. Richard Barella and Thomas Wright, eds.

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*Out-of-print yearbooks can be obtained in microform and in Xerox copies. For information on price and delivery, write to Xerox University Microfilms, 300 North Zeeb Road, Ann Arbor, Michigan, 48106.

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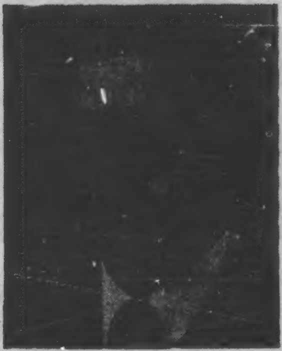

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Preface

This yearbook on the contributions that industrial arts makes to selected areas of education is an effort to establish the role that this field plays in the contemporary school setting. The various chapters deal with specific topical areas that are of significance to education, the student, and the citizen in this latter part of the twentieth century. The concept of this yearbook centers on the idea that the range and variety of experiential activities in industrial arts can make important contributions to all students as well as to the enrichment of selected content or subject fields. This position is part of the larger concept that the nature of schooling as well as the nature of the individual are organismic in structure and not a separate series of units or parts to be dealt with in isolation.

This yearbook is unique in that its intended use is with the professional educators and the decision-makers in education outside the industrial arts profession. The context of each chapter is in effect a beam of light extending out from the field of industrial arts into a number of educational concerns. It is to signal the role that this area can play in an educational system that is willing to examine the inherent value of all fields of study and the contributions they can make to each and every individual.

The fourteen topics dealt with in this yearbook do not exhaust the potential areas for contribution by industrial arts. They were selected because of their present-day prominence in educational priorities and the special contributions that Industrial Arts has for each. The writers of each of the chapters were selected because of their particular interest in the topic on which they wrote as well as a proven capability for dealing with it. The editors are especially grateful to each of the writers for their contribution of time and talent in making the yearbook possible.

A special note of appreciation is extended to Mrs. Dorothy O'Donnell, Mrs. Bonnie Dunn, and Ms. Wendy V. Williams for their assistance in the preparation of the final copy. As has been the case in the many previous yearbooks, Wesley Stephens has played an exceptionally fine and important role in facilitating the production of this publication. A special note of gratitude is due the editor, staff, and management of McKnight Publishing Company for their making this yearbook possible and for their contributions to the past thirty yearbooks. This has been an invaluable contribution to the industrial arts profession.

Finally, a special note of thanks and sincere appreciation to the Yearbook Committee for their dedication and assistance in the process of yearbook selection and maintaining standards for their fulfillment.

Chapter 1

Industrial Arts and Its Contribution to The Education of the Elementary School Child

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THE ISSUE

Industrial arts has a major contribution to make to the education of the elementary school child. The elementary school (grades K through 6) provides the basic foundation for the skills that enable an individual to achieve personal, economic, and social success in society (Scribner & Knox, 1973). It is during the elementary school years that the child's self-concept is formed. It is also a time, according to Llewellyn and Robinson (1974), when a child's "efforts are directed toward independence, achievement, production, and mastery of tasks as ways of gaining orientation to and control of his world" (p. 52).

Industrial arts is in a unique position to make a major contribution to the cognitive, social, and physical growth of the elementary school child through firsthand, concrete psychomotor activities. At the elementary school level, industrial arts can reinforce the traditional academic areas of social studies, science, language arts, mathematics, and the fine arts.

Industrial arts at the elementary school level can be defined as follows:

> A phase of general education, it provides opportunities for children to observe, study, experiment and work with processes, materials, tools, and machines through which man has adapted his physical world to serve his needs. It is the study of the ways and means by which materials and products of daily life are obtained, prepared and used, and their influence on society. Industrial arts is the study of man's relationship to his environment, to the world of work and to human recreation and leisure. (Scobey, 1968, p. 6)

This chapter will cover nine concerns related to the elementary school. Each concern is discussed with respect to established learning theory and what recognized authors in the field of education indicate should be occurring in the elementary school. Industrial arts can play a role in reducing the concerns and can make many contributions to the education of the elementary school child.

CHARACTERISTICS OF THE ISSUE

The elementary school has been and is still a very significant institution. According to Goodlad and Shane (1973), quantitatively

> it enrolls the largest percentage of the age group served, absorbs the largest proportion of money spent on formal education, and brings the largest return from this educational investment to both the state and the individual. In qualitative terms the elementary school educates during the most critical, formative years. (p. 1)

Being in this position, the elementary school has been the target of much criticism. The charges leveled against this institution have ranged from "tedium and irrelevance to charges of inhumane manipulation or outright neglect and mistreatment of children" (Goodlad & Shane, 1973, p. 3).

Following are nine concerns that have been voiced about the elementary school. Most of these are not unique to the elementary school, but rather pertain to all levels, from kindergarten to graduate school. It is felt that the elementary school, because of its importance in the development of our nation's future generations, is a fertile area for the implementation of solutions to the concerns to be discussed.

Concerns About the Elementary School

School is too impersonal, routinized, and irrelevant. Holt (1964) aptly described this problem:

> School feels like this to children: it is a place where they make you go and where they tell you to do things and where they try to make your life unpleasant if you don't do them or don't do them right. (p. 24)

All too often children are viewed as empty vessels to be filled to the brim with facts and information, or as computers that should be programmed with all of the answers needed to solve the problems with which they will be confronted. When it comes to evaluating how well the children have assimilated the information presented to them, emphasis is placed on having the "right" answers. Too much of what is often referred to as education is merely knowledge gathering and remembering (Glasser, 1969).

Lurie (1970), in discussing what is wrong with the school curriculum, noted that "the curriculum is no good because what the schools are teaching is not worth learning" (p. 50). Children learn that marks are everything and, if what is being taught is not going to be on the test, it is worthless. The problem of the relevance of what is being taught in our schools was accorded a whole chapter in Glasser's (1969) *Schools Without Failure* and was addressed several times in Holt's (1964) book *How Children Fail*. According to Holt, children are confused because much of what they are required to learn in school "hardly ever has any relation to what they really know—to the rough model of reality that they carry around in their minds" (p. 14).

Glasser (1969) defined relevance as "the blending of one's own world with the new world of school" (p. 53). When teachers fail to relate what they are teaching to the child's life outside the school, children, especially those having trouble with learning, do not gain the motivation to learn. Glasser summed up the problem of relevance in the curriculum: "Too much taught in school is not relevant to the world of the children. When it is relevant, the relevance is too often not taught, thus its value is missed when it does exist" (p. 52).

There is not enough student participation in determining what they do in their classes. In a six-year national study of schooling, Goodlad, Sirotnik, and Overman (1979) found the lack of student input in classroom curriculum decisions to be a problem. Klein, Tye, and Wright (1979), in reporting the preliminary findings of Goodlad et al.'s study, indicated that "more than half the students (at both the elementary and secondary level) reported a desire to have more control over what they do in their classes; this trend was stronger at the elementary level" (p. 247).

With regard to curriculum, Klein et al. (1979) concluded that teachers "were influenced mostly by their own experience, perceived a high level of control over their own planning and teaching, and were satisfied with that planning and teaching" (p. 247).

The major problem of the school is a problem of failure. If a student becomes bored with school and frustrated from memorizing one insignificant, irrelevant fact after another, or from covering the same material over and over again, he or she may soon lose the motivation to try and will then fail. Holt (1964) addressed this problem and noted that students fail because they are bored and confused. They are bored because their school assignments and materials are trivial and dull and make limited, narrow demands on the spectrum of their intelligence, capabilities, and talents. They are confused because the torrent of words that pours over them in school makes little or no sense. Instruction often flatly contradicts other things they have been told, and hardly ever has any relation to what they really know (p. 14).

The problem of failure is directly related to the development of the child's academic self-concept. According to Bloom (1977), a child's academic self-concept may significantly affect his or her overall self-concept. Glasser (1969) believes that the elementary school years (ages 5 to 10) are critical in the development of a child's academic self-concept, and good experiences in school contribute to the development of a positive academic self-concept.

Bloom (1977) thinks that students during their years of schooling are exposed to at least two different courses of study. The first is the manifest curriculum, which includes mathematics, social studies, reading, literature, science, and other school subjects. The second curriculum is the latent curriculum. "This curriculum is uniquely taught to and differently learned by each student. It teaches each student who he is in relation to others" (p. 193).

There is too much emphasis placed on the verbal mastery of subject matter. According to Calder and Antan (1970), "Verbal learning—reading, discussing, demonstrating, organizing, analyzing, synthesizing—is the stuff of education" (p. 23). Yet, there are students who, through lack of interest or skill, do not or cannot profit from a verbal format.

In discussing the widening literacy gap between the classroom and the real world, Mikulecky and Diehl (1979) indicate that between 2% and 20% of the population of the United States could be considered "functionally illiterate," and more than 11% of an adult population in a 1978 study by Mikulecky reported that they were quite uncomfortable with the reading requirements of their jobs.

How often do children come up with the right answers to arithmetic problems or repeat the principles upon which our democracy was founded without the faintest idea of what they are doing or how the principles are applied in the everyday running of their own community? The emphasis on the verbal mastery of subject matter often leads students to gather knowledge and memorize correct answers without truly understanding the subject. Glasser (1969) refers to this phenomenon as the certainty principle. According to this principle, "There is a right and a wrong answer to every question; the function of education is then to ensure that each student knows the right answers to a series of questions that educators have decided are important" (p. 36).

Little or no attention has been given to individualizing instruction. Teachers who treat students as equals in terms of their method of learning, their rate of learning, or their interests are bound to be ineffective with the majority of students in their classes. Klein et al. (1979) found that although elementary school teachers seem to individualize instruction more than their counterparts at the secondary level, the most frequent means of individualizing instruction are variations in teaching methodology and activities. Their report on the national study of schooling concluded that "overall, it appeared that not as much individualization is occurring as has frequently been recommended" (p. 247).

Too much emphasis is given to verbal teacher presentations. Klein et al. (1979) found that approximately 70% to 75% of class time is spent on instruction. Much of this time, it is the teacher who is talking. According to Nichols and Stevens (cited in Ladas, 1980), teachers should not assume that their students are always understanding or even listening to what they are saying in their presentations. According to these researchers,

> When first graders were stopped and asked, "What is the teacher saying?" 90% were able to reply, but only 80% of the second graders were able to reply appropriately. Forty-three percent of junior high school students knew what the teacher was talking about, but only 22% of high school students responded correctly. To project these stubborn facts to the college and graduate level are too frightening to consider. (p. 606)

In discussing the need for raising teachers' mathematical competence, Glennon (1980) provides further reason to consider the use of a variety of teaching methods:

> Teachers cannot teach for understanding that which they have learned associatively. They cannot teach what they do not under-

> stand. Over the past several decades it has been well established that the average elementary classroom teacher understands only about half of the topics that he or she teaches. (p. 593)

Too much emphasis is placed on the commercially produced textbook as a teaching tool. Glasser (1969) believes that the almost universal use of textbooks by teachers at all school levels and their belief that books should be heavily relied on handicaps both the teacher and the student. He found that what the students read in their textbooks was usually not related to their world outside of school. For students with reading problems, the heavy reliance on a textbook is a road leading to failure.

Rogers (1980) emphasized the prominence of the textbook in social studies classes. However, he questioned the use of the text as the primary teaching tool in this area when he asked, "What do children learn about the social sciences by being taught almost exclusively from books—that knowledge is inevitably contained between the covers of a book?" (p. 597)

There is a need for better reading, writing, and arithmetic programs. Brodinsky (1979), in a discussion of 10 events that influenced U.S. schools during the 1970s, described the back-to-basics movement as the 70's decade's best advertising slogan: "The popular outcry was for more and better reading, writing, and arithmetic instruction" (p. 239).

A considerable amount of time is devoted to teaching these basics. Eiser (1980) estimated that

> elementary school teachers devote about 60% to 80% of their formal instruction time to teaching how to read, write, and compute. Given a 25-hour school week, this means that about 16 to 20 hours are spent each week on these subjects. (p. 599)

The concern of the schools lies in the fact that too many youth are functionally incompetent in these basic areas. Ahmann (1976), in presenting a profile of the first national assessment (conducted between 1969 and 1972), provided the following significant findings regarding these basic skill areas:

1. Many school-age youngsters cannot read and understand simple directions, such as those for playing a card game, using a can of spray, or baking muffins. (p. 17)
2. Fewer than half of the 17-year-olds and young adults can successfully determine the most economical package size of food products when making cost comparisons. (p. 18)
3. Relatively few young Americans can read and interpret graphs, maps, or tables. (p. 18)

Considering how much time the elementary school teacher spends teaching the basic skills of reading, writing, and computation, these statistics indicate a definite need for the improvement of instruction in these essential skills.

There is not enough emphasis in the elementary school on learning about jobs and careers. Minimum competency in the "three R's" is not the only area that needs to be emphasized in the elementary schools. Brodinsky (1979) noted that "students indeed require a set of basic skills to get along in the world after graduation. These included, over and above the three R's, skills for citizenship, employment, family life, consumerism, enjoyment of the arts" (p. 239).

Career education was virtually unheard of until Sidney P. Marland stunned the educational community with the proposal that career education should be a continual process that should extend from the womb to the tomb. Wilhelms (1972) described the need to learn about jobs and careers, starting in grade 1:

> The image that boys and girls develop of themselves and of the possibilities life holds for them is crucial. Most young people know incredibly little about jobs. They may scarcely know what their own father does, or their mother if she works outside the home. (p. 17)

The critics of education are not alone in their efforts to include more career information in the elementary schools. In a 1976 Gallup Poll of attitudes toward the public school, 52% of the respondents thought that the elementary school curriculum should include information about jobs and careers (Smith & Gallup, 1977). Klein et al. (1979) in describing the preliminary results of Goodlad's *A Study of Schooling*, compared the responses of parents, teachers, and students (elementary and secondary level) in a rating of the importance of four major goals of schooling (intellectual, social, personal, and vocational). Their findings indicated that

> approximately 50% of parents and teachers said the intellectual goals should be emphasized. Next parents and teachers said they would emphasize personal goals (30% of teachers and 20% of parents), followed by vocational goals (20% of parents and 10% of teachers) and social goals (10% of parents and teachers). Student responses differed considerably. A smaller percentage of students (33%) than adults thought that the intellectual function should be emphasized, and a larger percentage selected the social (15%) and vocational (30%) functions. (p. 245)

Many different groups expect elementary schools to serve many purposes. The final results of studies, such as Goodlad's, are important for educators and curriculum developers. These individuals should be aware of the extent to which similar or different goals are perceived to be important by teachers, students, parents, and others (e.g., board members and administrators) before the planning and implementing of school programs.

Summary

The nine concerns and problems discussed in this section need not be restricted to the elementary school. This list is not intended to represent all of the recent concerns which have been leveled at the schools but rather is representative of areas consistently cited in the contemporary educational literature that are not being met by current educational practice.

The following sections will examine the concerns and problems just discussed with respect to the role that industrial arts activities, at the elementary school level, can play in their amelioration.

A REVIEW OF THE LITERATURE

Practices and Theories

Impersonalization, routinization, and irrelevance. According to Glasser (1969), schools "should be a place in which children can express their own ideas, based on their observations and experiences, and gain satisfaction from knowing that the school is interested in what they have to say" (p. 52). The content should be meaningful and relevant to the elementary school-age child. Bugelski (1977) addressed this point directly when he stated that "it has long been known that 'meaningful' material is learned more readily than 'nonsense' material" (p. 27).

Even if the teacher is teaching a relevant curriculum, pains must be taken to teach children how they can use what is being taught in their life outside of school. The routine of rote learning and memorizing facts should be interspersed with activities that involve learners and their imagination.

Industrial arts activities provide an opportunity for students to use their imagination to solve practical problems. Students involved in industrial arts activities at the elementary school can make some type of physical model, be it simple or complicated, based on how they conceptualize the problem. Thus, students are actively involved in producing something that is relevant to them, and each student can take more or less time than fellow students to complete the activity.

Not enough student participation. Overall, the elementary school can be characterized as one in which teachers make most or all decisions that occur at the classroom level (Klein et al., 1979). Such an autocracy serves more to hinder than facilitate learning. Walberg, Schiller, and Haertel (1979) emphasized the importance of student participation in determining their classroom activities. They noted that in general, greater amounts of cognitive, attitudinal, and behavioral learning take place "in classes that students perceive as cohesive, satisfying, difficult or challenging, democratic, and providing the physical setting and materials required for learning" (p. 182).

When elementary school teachers use industrial arts activities in their teaching, they automatically provide a way to involve students in making decisions about what they will learn and how they will go about learning it. Industrial arts, when incorporated into any academic subject, allows for individual variations in the finished product and for direct student participation in activities selected and deemed worthwhile by the student.

The problem of failure. The overall effects of failing in school are long range and cumulative. Glasser (1969) wrote

> Once a child receives the failure label and sees himself as a failure, he will rarely succeed in school. . . . Having learned failure in school, they (adolescents and adults) now give up all effort to think and work effectively. They are defeated by failure. (p. 97)

Holt (1964) believes many students fail in school because of the amount of irrelevant, repetitious material they are forced to learn and because they have little to say regarding course content.

Postman and Weingartner (1973) suggest that one way to motivate students and reduce failure is to allow students to participate in selecting their activities. They characterize a good school as one that "does not require all students to engage in the same activities, but gives them considerable latitude in choosing from among many options" (p. 31).

The infusion of industrial arts activities into the academic curriculum of the elementary school can contribute to reducing the degree of failure that often accompanies abstract, academic subjects. If students actively participate in the learning process and solve problems they have selected with the guidance of the teacher, abstract material becomes more understandable. When the elementary teacher uses industrial arts activities to supplement a history unit, all children do not have to do the same activity. The activity chosen by each child is based upon the child's interests, not the teacher's.

Too much verbal mastery of subject matter. In discussing the need for effective citizenship, Wilhelms (1972) referred to the verbal mastery of subject matter without any accompanying meaning or application as a "substitution of informational minutiae for function" (p. 26). Holt (1964) attacked the emphasis on verbal mastery without meaning:

> It is not subject that makes some learning more valuable than others, but the spirit in which work is done. If a child is doing the kind of learning that most children do in school, when they learn at all—swallowing words, to spit back at the teacher on demand—he is wasting his time, or rather, we are wasting it for him. This learning will not be permanent, relevant, or useful. (p. 178)

Postman and Weingartner (1973) further condemn the heavy emphasis given to the verbal mastery of subject matter. A good school, in their opinion, moves away from valuing knowledge for knowledge's sake and moves toward valuing the use of knowledge in daily life. In other words, "A good school comes very close to saying that if you do not act as if you know something, then you do not know it" (p. 33).

Industrial arts activities at the elementary school level can enable students to obtain meaning from the subjects they study. When children are actively involved in concrete activities related to a subject, practical mastery, rather than verbal mastery alone, results (Downs, 1974).

Individualization of instruction. The third-grade elementary school class includes some students who operate on the first-grade level and some students who operate on the sixth-grade level. This six-grade spread, in both achievement and learning rate differences, increases as a child grows older (Ladas, 1980). Clark, Lotto, and McCarthy (1980), stated that "successful schools and programs frequently employ techniques of individualized instruction" (p. 469). Bugelski (1977) emphasized the need to individualize instruction:

> There may never be a general prescription for learning that will fit all specimens of the human race. Not only do age groups differ in their abilities to learn, but individuals have different learning capacities at different times in their lives. (p. 20)

Industrial arts, with its firsthand, concrete learning activities, provides many opportunities for individualization. "Differences in ability, whether intellectual or manual, can easily be adjusted (when utilizing industrial arts) through different activities or through varying responsibilities" (Scobey, 1968, p. 11).

Emphasis on verbal teacher presentations. Bugelski (1977) said that "no one can teach anyone anything; he can only arrange the conditions whereby a learner might learn" (p. 30). Because of teacher dominance in the classroom, many students often do not become actively involved in the learning process. Their opinions, ideas, and judgments are usually not elicited, and they think that what they have to contribute is not important in education (Glasser, 1969).

Dunn and Dunn (1978) commented on the effect of standard teaching practices in the elementary school on students who are tactual or kinesthetic learners.

> In reality, however, we usually teach by telling (auditory) and by assigning readings (visual) or by explaining and writing on a chalkboard (auditory and visual). Our own research during the past decade verifies that many students who do not do well in school are tactual or kinesthetic learners; their strongest perceptual strengths are neither auditory nor visual. These boys and girls tend to acquire and retain information or skills when they are involved either with handling manipulative materials or by participating in concrete "real life" activities. Because so little of what happens instructionally in most classes responds to the tactual and kinesthetic senses, these students are, in a very real sense, handicapped. (p. 317)

Students should become involved in learning and do the heavy work. Industrial arts activities are "learning-by-doing" oriented and involve activity on the part of the learner. When actively engaged in constructing, manipulating, and experimenting, children become more interested, learn more easily, and retain learning longer (Scobey, 1968). Industrial arts activities are especially suitable for reinforcing academic concepts at the elementary school level because these children have limited experiences on which to build abstractions. Students who build a simple model of an Indian village learn more about Indian life and the materials used by the Indians than they would by just listening to the teacher discuss Indian villages or reading about them in a textbook.

Too much emphasis on the textbook as a teaching tool. The textbook has its place, but reading primarily restricts the individual to using the visual sense. If one uses Dale's (1946) "cone of experience", reading (visual symbols) is second only, in level of abstraction, to speaking (verbal symbols). In addition to the necessity of having elementary school activities being student rather than teacher centered, the teacher should include field trips into the community, contrived experiences, and, whenever possible, direct purposeful activities that involve the student and use as many senses as possible. The elementary school teacher should not abandon the lecture or the use of a textbook but should supplement these methods with activities that allow students to do as much inquiring, generalizing, and verifying as possible (Postman & Weingartner, 1973).

The teacher can use community resources in conjunction with industrial arts activities. In studying a particular unit, the class can visit a construction site in the community. After returning to the class, the teacher can have the class involved in a construction activity that will allow the students to experience, firsthand, some of the tasks and skills required in the occupations observed at the construction site. Here, the industrial arts activity can be used to enrich the field-trip experience and extend it beyond verbalization and visualization to a multisensory, multimaterial approach.

Need for better reading, writing, and arithmetic skills. It is important that all young people learn to use the language well, communicate effectively, and be functionally literate in basic mathematical operations. All too often skills in these basic areas are taught, abstractly, through a heavy reliance on the rote memory of verbal and visual symbols. All too often not enough consideration is given to making these basic skill areas relevant and meaningful to the child. Dale (1972) brought this point out when he stated that:

> No one would advocate meaninglessness in education, but every day teachers and texts present unclear materials to students. Rote methods of teaching and learning are common. A typical remedy when students do not understand is "more of the same"—work harder and read the materials over and over again. (p. 61)

The learning of any subject area is enhanced by making the subject relevant to the child's needs rather than teaching it because "we've always done that" (Postman & Weingartner, 1973, p. 21). Holt (1976) reaffirmed the need for relevance in teaching the basic subjects: "We are very unlikely to learn anything good from experiences which do not seem to us closely connected with what is interesting and important in the rest of our lives" (p. 12).

Industrial arts activities can play an important role in the development of a child's understanding in the basic subject areas. According to Maley (1979–80)

> The important ingredient that industrial arts brings to the student's development in reading, writing, calculating, observing, and physical activity is that it is in keeping with the student's purposes and not as an exercise or teacher assignment. (p. 22)

Among others, Dale (1946) noted the need for the road to fruitful learning to be well paved with concrete, meaningful experiences. Industrial arts activities can add relevance to the teaching of the basic skill areas because they can be used to enhance the development of basic skills through the children's active involvement with concrete materials that focus on purposes established by the children themselves.

Need for more emphasis on jobs and careers. According to Wilhelms (1972),

> Schools desperately need ways of getting children and youths acquainted with wide areas of the world of work. Starting in kindergarten and climaxing in the junior high school years, where plans begin to crystallize, they need an ongoing, attractive, informative program. (p. 18)

All too often, children are not aware of the many jobs and careers that are available to them, and they make their career decisions on the basis of limited information. A child's knowledge of jobs and careers should be developed "starting in kindergarten and continuing all the way through high school" (Wilhelms, 1972, p. 19).

Participation in industrial arts activities that are used to supplement an academic subject can provide an excellent opportunity for elementary school children to get the feel of various kinds of work through firsthand experiences with various jobs. Students no longer have to think only abstractly of what is involved in working on an assembly line or what the quality control department is responsible for. They can, through industrial arts experiences, supplement their reading and discussion about these and other jobs with actual firsthand experiences.

Summary

The individuals cited in this review of the literature are but a few of those who suggest theories and practices that can be applied to the nine concerns mentioned earlier. Most of the concerns involve violations of known principles of learning and good educational practice. Industrial arts, if it is used to supplement existing elementary school academic subject matter, could help eliminate each concern.

CONTRIBUTIONS OF INDUSTRIAL ARTS TO THE EDUCATION OF THE ELEMENTARY SCHOOL CHILD

A review of the literature reveals that industrial arts has many significant contributions to make to the education of all children. This section, however, will be limited to the contributions that industrial arts can make toward alleviating the nine concerns on which this chapter has focused, and, in so doing, describe the contributions that industrial arts can make to the education of the elementary school child.

Contributions of Industrial Arts

Personalization, variation, and relevance. Industrial arts activities promote personalization of the learning experience by allowing children numerous opportunities to express their own ideas through the use of concrete materials. Industrial arts activities promote active learning in experiences selected by students that they perceive as meaningful. In an activity corner or at their own table, children can proceed at their pace—be it fast or slow—and produce a product that is within their capability. Students can use their imagination to produce physical models, which help them understand an abstract concept. The activity selected can be simple or complex, depending on the child's ability and grade level.

As an example, Swierkos and Morse (1973) suggest to help a second-grade student learn to tell time, a clock with movable hands can be constructed. For some children, this clock would simply be a piece of cardboard or a manila folder with the hours lettered on with cardboard strips for hands. For others, the process of making the clock could involve wood or other materials and the use of common hand tools. The design of the clock (square, round, oval, etc.) can be up to the individual student and could involve some rather precise measurements.

With this simple project, each child can work at his or her own pace and select materials that are within his or her capabilities. The clocks can be personalized by the size, shape, art work on the face, or color. The project is not done for its own sake but so the child understands an abstract concept, that of telling time.

This activity, like most industrial arts activities, can be used to integrate any number of subjects to make them relevant to the student. Depending on grade level, the teacher can discuss the gearing in a clock as a topic in science, read about clocks as a language arts activity, discuss the occupational careers involved in making a clock from the raw material to the finished product, and discuss the importance of being on time for school, work, or other scheduled activity. Other examples of how industrial arts activities can be integrated into the academic curriculum of the elementary school can be found in Scobey (1968), Calder and Antan (1970), Gerbracht and Babcock (1969), and Kirkwood and South (1973).

Active student participation. Bugelski (1977) stated that

> No one can teach anyone anything; he can only arrange conditions whereby a learner might learn. . . . The very term teacher is probably a meaningless label. A better name is educator. The educator "draws out" the learner or leads him out of his ignorance, but it is the learner who must take the steps for himself. (p. 30)

The inclusion of industrial arts activities in the elementary school curriculum can change the situation from one in which teacher does the talking and makes most or all of the decisions to one in which the teacher becomes an "educator" and the students actively make decisions and participate in the learning experience.

As an example, a fifth-grade class may be studying the effects of the railroad on the life of the Plains Indians in a social studies unit. Instead of just a teacher-directed discussion of the railroad's effects, the students could build a model of an Indian village located near a railroad. To construct this display, students would have to become actively involved in the design, construction, and solution of the problems involved in depicting an Indian village of the mid-1800s. Because students would make the decisions, the activities would be more related to the goals that the students have established for the project.

Ingram (cited in Downs, 1974), in a study conducted to measure the effect of elementary school industrial arts pupils' social studies achievement, found that significant learning was not confined to the social studies area alone. He found that

> all experimental groups studying the social studies units incorporated elementary school industrial arts activities improved their silent reading comprehension and work study skills during the period of the study although silent reading and work study skills were not a direct part of the unit. (p. 255)

Success. Success and a good academic self-concept are highly correlated. Few children start school labeled as failures. Industrial arts activities in the elementary school can contribute significantly to the development of a child's positive academic self-concept by helping the child understand abstract concepts through the use of concrete materials. The rewards of using industrial arts activities are at least twofold. In addition to obtaining a better understanding of the abstract concept involved, the child has an opportunity to succeed at a school-related task—the constructional activity. The activity that is selected by the child, with the guidance of the elementary school classroom instructor, can be one that is suited to that particular child's present level of cognitive and psychomotor ability. Participation in the activity selection process assists students in internalizing that goal and thus provides a source of student motivation.

Emphasis on learning by doing. According to Dale (1946), "Education's greatest weakness appears when pupils are made to memorize general rules and concepts when they have never had the experience to understand them" (p. 35). All too often, elementary school students attain a verbal mastery of their subjects; but when asked to explain what they are saying or to make meaningful generalizations about the material, many cannot.

Industrial arts activities at the elementary school level provide ample opportunity to add meaning to verbal material through the use of constructive activities. As an example, students in the fourth grade may study a unit on Pilgrim life in Plymouth, Massachusetts. They may read about how the Pilgrims had to preserve their foods, make their candles, and convert fibers into fabrics to make their own clothing. If the study of this unit were to remain at the textbook level, the students would have a shallow understanding of the amount of time needed to do these necessary tasks or the amount of work involved in doing them. If, however, the teacher contrived an experience in which the class became actively involved in making candles, preserving food, and building and using simple looms, the hardships of the Pilgrims would be understood rather than just mastered verbally. The constructive activities could also serve as a springboard for writing, reading, and speaking activities. Scobey (1968) is an excellent source for the kinds of activities described above.

Individualization. "A school is good when it does not require all students to engage in the same activities, but gives them considerable latitude in choosing from among many options" (Postman & Weingartner, 1973, p. 31). The hands-on, concrete learning activities of industrial arts naturally provide for individual differences. Elementary school students can learn similar concepts in many ways through industrial arts activities. Students can select activities or complete the same activity at various levels of sophistication. This depends on the individual student's present physical and mental development and interests.

Differences in ability, either physical or intellectual, can be easily adjusted through the selection of different activities or through the acceptance of different responsibilities. For example, a third-grade class may study America's energy resources in a social studies unit and use only the textbook. Students with reading and comprehension problems will be at a disadvantage because using one method limits their learning and all are required to study the unit through that one method. On the other hand, if the text and class discussion were supplemented with a hands-on activity (e.g., the development of a model or models depicting the mining, transporting, and uses of the various forms of energy), each student could choose an activity that is commensurate with his or her abilities and preferences. In this way, students have a say in determining their curriculum. They can select activities that will allow them to succeed rather than fail, and they can proceed at their own rate in completing the activity.

Including industrial arts activities in the elementary school curriculum provides the teacher with a method for accommodating individual differences and promotes a situation that is representative of the world the students will live in outside the school.

Emphasis on student participation. According to Holt (1976), a "common and mistaken idea hidden in the word 'learning' is that learning and doing are different kinds of acts" (p. 13). Holt, along with several other authorities in the field of education, believes that learning and doing are not two separate processes, but one. The term *learning by doing* is synonymous with industrial arts. Through direct involvement with industrial arts activities, the learner, rather than the teacher, becomes the focus of classroom activities. Learning should be activity oriented, for according to Durrell (cited in Dale, 1946), "The world of the child, particularly in the elementary school, is a sensory-motor world; he is interested in things that he can see, hear, touch, taste, plan, make, do, and try" (p. 17).

For example, if students are studying the human heart, their understanding of this vital organ can be greatly enhanced if the teacher-directed discussion is supplemented with a constructive activity in which the students replicate a heart using readily available materials. In the construction process, the student involves not only the senses of hearing and vision, but also smell, touch, and, more often than not, taste. The more senses that are included in the learning process, the more input the student has, which will add meaning to the material being studied.

Direct student participation in the construction of the heart involves a feeling of discovering, experimenting, and trying things out. Students can test their own ideas and notions about how a heart can be represented in a working model. They are motivated because they are actively engaged in learning and not passively accepting the experiences of the teacher or other "experts."

The construction of a heart model by the students can be emotional. It may be a satisfying or a frustrating experience, but never a neutral one. Compare that to the emotional experience of sitting in the class and listening to the teacher day after day! Finding workable solutions to the problems faced in designing the model are sure to elicit a flow of emotion, provide a rich experience in problem-solving, and give students an "I did it myself" feeling.

Emphasis on a variety of informational sources. According to Dale (1946), "Textbooks are commonly used because they offer a means for teaching the vastly increased number of pupils in schools—textbooks give the teacher a feeling of security" (p. 50). Too much reliance on learning from the textbook alone promotes what Dale refers to as verbalism; that is, "the use of words which are not understood" (p. 16).

Children come to school with approximately 2,000 words that they learned between the ages of one and five through tasting, talking, seeing, touching, and listening to others. These words, learned before they learned to read, are seldom forgotten because most words were learned through direct, concrete experiences (Dale, 1946). The infusion of industrial arts activities into the academic curriculum of the elementary school allows each student to learn through direct purposeful experience, the same method that people have used to learn through almost all of human history. If fourth-grade students read about the electric motor in their science textbook, discuss it as a group, and are tested on it, memorization rather than understanding is promoted. Such terms as *brushes, commutator, armature,* and *field windings* may be remembered for the test; but they have little if any meaning to the students and are quickly forgotten.

If, however, students become involved in the actual construction of a simple electric motor—whether it be from a kit, or by using nails, wood, and wires—electric motor nomenclature will have meaning to them. They will have a mental image of a commutator and understand its purpose in an electric motor. The terms will no longer be just verbalism.

Enhance the development of reading, writing, and arithmetic skills. Maley (1979–80) provides evidence that the use of industrial arts activities in the elementary school contributes significantly to the development of basic skills in the areas of reading, writing, and arithmetic. According to Maley,

> the important ingredient that industrial arts brings to the student's development in reading, writing, calculating, observing, and physical activity is that it is in keeping with the students' purposes and not as an exercise or teacher assignment. (p. 22)

When a student is engaged in a project that is of interest and it is perceived as "his" or "her" project, the student will more readily become involved in writing, reading, and any necessary arithmetic to complete the project successfully.

Maley (1979–80) pointed out another contribution that industrial arts activities make to the development of basic skills:

> Another important ingredient in the industrial arts contribution to the "basic" skills is that the particular function (reading, writing, etc.) is carried out in conjunction with some physical object, project, process, or role involvement. (p. 22)

The "basics" are reinforced through participation in direct, concrete experiences that are relevant to the student's goals.

Career oriented. All too often, children decide what they would like to become on the basis of their limited experiences and by observing individuals in their immediate environment. Discussion of careers outside of the child's immediate environment serves to make students aware of additional careers, but discussion alone provides only a shallow understanding of what is required of individuals involved in those careers.

Involving elementary students in industrial arts experiences can be an effective vehicle for providing firsthand information about many careers. According to Wilhelms (1972), "Career education is not a subject. It is a set of influences, running through every part of education, and its work is mostly inside the person" (p. 19). Industrial arts activities can be used to enable students to build concepts about careers through participation in concrete experiences related to careers. Children can draw conclusions about a career or occupations within a career based on their firsthand experiences. They can then apply those conclusions to narrowing down their career choice.

When using industrial arts activities to enhance academic subjects, the instructor can capitalize on activities students are involved in by relating them to careers. On the other hand, the elementary school instructor can purposely design an activity in which one of the main goals is knowledge of careers. For example, the instructor can, with the help of an industrial arts specialist, set up a mass production project to acquaint students with the concept of the interchangeability of parts. In addition to providing a means of correlating mathematics (i.e., amount of material, measurements, cost of the product and wages), English (i.e., writing reports about the experience, developing product literature), and social studies (i.e., the study of unions, sources of materials, and transportation to the marketplace), this activity can be used to provide students with a firsthand knowledge of how a company operates and about the jobs of designing, production, and marketing of the product.

Students can identify the occupations associated with the company, research and write job descriptions, be interviewed for the jobs available, buy stock in the company, and perform a job in the company.

This experience can be simple or complex, depending on the grade level and ability of the students.

SUMMARY

Industrial arts activities are rich in firsthand, concrete experiences. When they are integrated into the academic curriculum of the elementary school, industrial arts activities can help alleviate the concerns discussed throughout this chapter and thus make a number of significant contributions to the education of the elementary school child. One may argue that heavy reliance on industrial arts activities to supplement the academic subjects of the elementary school may cause the child's education to become "too concrete." The danger of using too much verbalization in the teaching of generalizations and concepts is far greater. The necessity for concrete experiences, such as those afforded through industrial arts activities in the learning process, was aptly summarized by Dale (1946):

> Learning is an interacting process. We move from the concrete to abstract and back to the concrete. It is a shuttling back and forth in which generalizations help us to understand new concrete experiences. The concrete experiences in turn help us to improve our generalizations or to build better ones. In short, we construct our experience. If we understand this dynamic relationship between the concrete experience and the generalization, we can get a fresh view of concept-building in the classroom. (p. 29)

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Chapter 2

Industrial Arts and Its Contribution in Assisting the Student with Developmental Tasks

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THE ISSUE

Industrial arts can make a significant contribution toward assisting the student in accomplishing developmental tasks.

This premise is based on the concept that the school must place a major emphasis on the development of people. The corollary is that industrial arts can play a significant role in the development of people, and as such development is related to the developmental tasks of youth.

Developmental tasks play a vital role in the growth and maturation of individuals in a given culture or society. Goldner (1973) provides the following description of developmental tasks:

> Developmental tasks are a list of children's needs stated in terms of cultural expectations, abilities, and skills. Society expects the child to accomplish certain developmental tasks within designated developmental stages. (p. 54)

The tasks are in many respects common growth or developmental elements for most individuals as they proceed to grow or mature. Tryon and Lilienthal (1950) discuss the nature of these tasks and the importance of such items in the life of the person.

> As an individual proceeds from birth to death, there are certain "tasks"—certain learning, adjustments, achievements—which he must master if he is to make normal progress. Developmental tasks are those major common tasks that face all individuals within a given society, or sub-group of society. (p. 77)

The developmental tasks have their derivation in the culture as well as from within the individual. Havighurst (1976) identifies several sources for the tasks related to a given individual:

> Developmental tasks may arise from physical maturation, from the pressure of cultural processes upon the individual, from the desires, aspirations, and values of the emerging personality, and they arise in most cases from combinations of these factors acting together. (p. 6)

Another perspective on the nature of developmental tasks places such tasks within the framework of social expectations. This point has been made by Hurlock (1972) with the indication that the tasks have certain cultural group relationships.

> In every cultural group, experience has shown that people learn certain behavioral patterns and certain skills more easily and more successfully at some ages than at others. The group then comes to expect each individual to perform according to this timetable of development. Such social expectations are known as developmental tasks. (p. 29)

To provide for a more explicit description or interpretation of the nature of developmental tasks, the following list of such tasks are those identified with the period of early adolescence (Tryon & Lilienthal, 1950).

1. Establishing one's independence from adults in all areas of behaviors.
2. Accepting one's self as a worthwhile person, really worthy of love.
3. Behaving according to a shifting peer code.
4. Strong identification with one's own sex mates.
5. Learning one's role in heterosexual relationships.

6. Reorganizing one's thoughts and feelings about one's self in the face of significant bodily changes and their concomitants.
7. Accepting the reality of one's appearance.
8. Controlling and using a new body.
9. Using language to express and to clarify more complex concepts.
10. Moving from the concrete to the abstract and applying general principles to the particular. (pp. 84–87)

Each of these developmental tasks represents an important milestone in the lives of most students during the period of early adolescence in the American society. The emphasis that the individual and society place on these developmental items makes it imperative that the school deliberately design and structure activities into the program that will in a significant way contribute to the achievement of the developmental tasks. "A good school is one that makes a maximum contribution to the performance by the children of their developmental tasks" (Havighurst, 1977, p. 104).

The importance of industrial arts' role in this educational function is heightened by the nature of the environment and the person-development activities that are possible in the program. Thus, the issue that industrial arts can make a significant contribution in assisting students in accomplishing their developmental tasks will be the major focus of the sections that follow.

CHARACTERISTICS OF THE ISSUE

The complexity of the present-day school system brings with it many concerns that deserve the fullest attention of the teaching profession and the community it serves. The problems of alienated youth, lack of student motivation, the drop-out issue, teacher burnout, student behavior interpretation, and putting theory into practice are but a few of the concerns that may have some of their roots in the need for a greater understanding of the growth and development of children and youth. A major flaw in the process of education is frequently that of realizing the role that the various subject or discipline areas in the school can play in helping alleviate the nature and extent of the problem. Specifically, this discussion centers around the role that industrial arts can play in helping young people in the developmental tasks that relate so fundamentally to many of the school's problems and concerns.

The first characteristic of the issue is one of respect and openness on the part of educators for the role and contributions that can be associated with the various areas of the school. The opportunities for a student to experience success, achieve a positive self-image, achieve personal independence, and explore his or her talents is not the prerogative of any one or two areas of the school. The different nature of each individual in terms of potential for personal impact, learning styles, sources of satisfaction, and personal drives should compel the informed educator to examine the full scope of experiential involvement for students in the system.

The lack of effectiveness in dealing with the developmental dimensions of the individual's growth and maturation is manifested in many and varied forms of behavior. Trow (1963) made the following observation with respect tc this aspect of the issue:

> From studies of child growth and development it has been discovered that many of the age-old educational problems of instruction and of maintaining discipline arise not because of total or even partial depravity of the child, but because school tasks have been set for children, which they are not sufficiently mature to perform. (p. 19)

Closely related to the observation as expressed by Trow is the lack of emphasis on the need to understand the dynamics of developmental functioning of the preadolescent and the adolescent as he or she attempts to deal with the academic and content dimension of the school program. It is as if there were two worlds in which the individual must function. There is the world of the self and the nature of developmental tasks the individual is pursuing at a given time. The other is the world of the academic and subject matter involvement. The reality of this person-school interaction is that the world of the self as it is related to the developmental task concept has a much more powerful influence on the person and assumes a higher priority over the world of academic and subject matter involvement.

The conflict of these two worlds is expressed by Cantor (1961) as follows:

> The preadolescent and adolescent find themselves in high school. How little the average high school teachers appreciate the nature of the real problems of their pupils! The teacher wants to "train the mind," fill it with ideas and facts by means of lessons to be "learned." The pupils "take it" and return it. Their curiosities, confusions, imaginations, loves, and hates, with regard to themselves, their parents and others, belong in a world almost totally ignored by the school. Their real problems remain more or less concealed. (p. 94)

The bridging of these two worlds is largely a matter of professional development in two important areas. The first is the science and practices that grow out of the study of human growth and development. Baller (1962) emphasized "To understand children, we must understand their ways of growth. This is why we need a science of child development to interpret the more mysterious meanings of child behavior" (p. 44).

The vital nature of the developmental tasks in adolescence is expressed by Hoover (1972) in his text *Learning and Teaching in the Secondary Schools.*

> It is evident that the developmental tasks of adolescence are not only complicated but important. They might be considered the basic dimensions around which all adolescent behavior revolves. (p. 8)

The second important area of needed professional development among educators deals with the nature and function of the "whole" of the school. The school is still viewed as a series of isolated units (disciplines, departments, subjects) without much thought as to how various forms of environment and student involvement have impact on the individual's ability to learn. The issue is one of "wholeness" of the school in dealing with the "wholeness" of the learner and the need to abandon the age-old, indefensible partitioning of the school and child. There also is the professional need to develop educators capable of making optimum use of the total school in the process of experiential design that will reach out to all students. This will require new levels of understanding of the nature and contributions of all areas of the school.

The "characteristics of the issue" center around several needs and concerns related to understanding the individual student and the role that various components in the school can play in assisting the person in achieving his or her developmental tasks as well as being successful in the cognitive, affective, and psychomotor objectives of the school.

1. Assisting the individual's effort to achieve certain developmental tasks is a responsibility of the school.
2. The developmental tasks for each individual assume a high priority in their daily living in and out of school.
3. The varied opportunities for experiential involvement in the processes of academic achievement as well as developmental task attainment are available in most secondary schools.
4. Maximum effectiveness can be achieved as educators develop an awareness and an openness to the contributions

that can be made to the individual's growth and development by the various areas of the total school program.

5. The student-centered program takes into account the developmental tasks of the students and makes a concerted effort to facilitate this achievement.

REVIEW OF THE LITERATURE

The effectiveness of the educational program in large measure depends on the degree to which the teacher is sensitive to and makes use of the developmental growth needs of the student. The actual function of the school has been tied to the process of assisting the student in achieving certain developmental tasks. Havighurst (1977) stated that "education may be conceived on the effort of society through the school, to help the individual achieve certain of his developmental tasks" (p. 103).

A similar point was made by Perkins (1969). He stated,

> Education must be seen as facilitating each student's development and learning rather than only imparting skills and knowledge. Each student brings a unique developmental history and readiness to the common tasks of growing up, and each encounters some problems of adjustment which will influence his ability to master their tasks. (p. 326)

The significance of the comments of Havighurst (1977) and Perkins (1969) is that they project a role for education in the actual assisting of the student's achievement of developmental tasks. Such an involvement on the part of the school brings with it a vastly different role than that which deals with content or skill mastery. This new role also imposes new requirements on the teachers in their ability to identify the nature of tasks in which a student is involved and also to be able to design and/or carry out educational strategies that would be instrumental in the student's achieving such tasks.

Such requirements for teachers highlight the importance of the study of child development and the vital part it plays in the work of the teacher. Ausubel (1977) stressed this point in a comment that established child development as one of the basic sciences necessary for the professional preparation of teachers

> because it offers important insights about the changing intellectual and emotional capacities of children as developing human beings,

> child development may legitimately be considered one of the basic sciences underlying education and guidance as part of the necessary professional preparation of teachers—in much the same sense that anatomy and bacteriology are basic sciences for medicine and surgery. (p. 122)

Expressing a similar viewpoint, Tryon and Lilienthal (1950), linked the concept of developmental tasks to a framework or knowledge base for understanding and dealing with children in the schools.

> The concept of developmental tasks provides a framework within which we can organize our knowledge about human behavior and learn to apply this information in dealing with children in our schools. (p. 77)

The relationships of the developmental tasks to the actual educational program is related to the stage of development the student is pursuing. Havighurst (1977) made this point in the following comment:

> When the body is ripe, and society requires, and the self is ready to achieve a certain task, the teachable moment has come. Efforts at teaching, which would have been largely wasted if they had come earlier, give gratifying results when they come at the teachable moment, when the task should be learned. (p. 104)

This teachable moment is related to many forces, such as societal expectation, stage of development of the individual, and biological readiness of the individual. Although the developmental stages of individuals generally follow a set order, there may be expected some variation in the speed that such developments are dealt with or achieved. Leeper (1968) expressed this concept in the following statement:

> Stages of development always follow in a particular order. The child does not stand before he sits, nor does he draw a square before he draws a circle. This orderly progression of events moves forward at different rates of speed, some children growing and developing at a faster rate than others. (p. 32)

The inference here is that there is an orderly progression of some tasks that emanate largely from the individual's ability to function. Other tasks may find their orientation in the society or culture in which the individual lives. This societal orientation may tend to establish certain timetables for specific tasks to be achieved and that the societal expectations become a criterion for individual achievement. Neugarten and Havighurst (1975) presented this societal phenomenon in relation to the concept of development tasks.

> Every society is age-graded and every society has a system of societal expectations regarding age-appropriate behavior. The individual passes through a socially-regulated cycle from birth to death as inexorably as he passes through the biological cycle: and there exists a socially prescribed time table for the ordering of major life events . . . although the norms vary somewhat from one socioeconomic, ethnic, or religious group to another, for any social group it can easily be demonstrated that norms and actual occurrences are closely related. (p. 117)

The development of the individual's social capabilities is one of those developmental tasks that generally appears at the period of early adolescence. At this time, group affiliation and group association begin to play an important role in the life of the person. As this group relationship is being developed, however, there is also the need to develop a level of democratic-social participation that will permit the group association to be successful. Havighurst (1968) described this form of human development.

> From the fifth grade on, boys and girls are very much concerned with their abilities to get along with their age mates in the peer group. They form teams, committees, and clubs and are very much aware of the personalities of people of their own age. This is the time for the development of a democratic-social relationship, gained by working out the rules of playing and living with one's equals. (p. 121)

This process of achieving satisfactory group involvement and group acceptance appears as a natural outgrowth of several interrelated phenomena that are developing in the individual at this period. Cole (1964) discussed this social development of the adolescent in her text, *Psychology of Adolescence.*

> This development seems to reach intensification during adolescence, when the constellation of life experiences, of expanding horizons, of deepening emotions, and of widening social contacts evokes a central need in the adolescent to recognize himself as a whole person, and to relate himself to other individuals and to the social patterns in which he lives. (p. 267)

This interaction and identification with a group of peers are of vital importance in the socialization and self-development of each child and adolescent (Perkins, 1975). The application of this peer-group phenomena to the programs in industrial arts is established in the form of group processes specifically designed to provide such social and peer interaction for the student. The group project approach, student seminars, and line production or enterprise experiences are natural, life-like designs for learning that are built upon the natural needs of students at the time of adolescence.

One other important dimension of the industrial arts program is the experiential nature of the student involvement, which in many instances includes the project method. The project in this case becomes the vehicle for integrating subject matter, and provides an opportunity to reveal the interrelatedness of the various disciplines. In this regard, the project serves to strengthen the learning by establishing meaning and application to that which is learned. Ausubel (1974) described the role of the activity and project methods as follows:

> Another underlying assumption of activity and project methods is that concepts and factual data are retained much longer when they are meaningful, genuinely understood, and taught as larger units of interrelated materials than when they are presented as fragmented bits of isolated information and committed to rote memory. (p. 107)

The larger units of interrelated materials may be the group process—group project and line production experience in which the content of industrial arts and the developmental tasks of youth are permitted to be achieved in an integrating experience. Just as there is a need to deal with the content in a more holistic, integrated form, there is likewise a need to deal with the developmental tasks of youth in an experiential, contextual frame of reference approximating the real world beyond the school.

Llewellyn and Robinson (1974) addressed this concept of providing the content and the achievement of developmental tasks within the framework of industrial arts.

> The challenge to the curriculum developer is clear: How can the school help the child learn to live better by using the resources of technology and machine culture to achieve the fullest kind of human growth? One answer to this is to help children gain an understanding of their technological society through means that enable them to meet successfully their developmental tasks at the time the tasks are arising. (p. 57)

This is the role that industrial arts can play. It is a dual role in that the content centers around the context of a technological society. At the same time, the nature of the activities and learning experiences in industrial arts can be directed toward the specific behavioral and developmental tasks the learner is pursuing. It is through a combination of mental-motor activity in relation to a great deal of peer and social interaction that the whole child begins to take form. In discussing the value of motor activity, Rowland and McGuire (1977) state that "Piaget is convinced that intelligence develops out of motor activity, not just out of passive observation—the wider the range of activity, the more diversified will be the intellectual operations of the developing child" (p. 120). The unique, personal-interactive environment of the industrial arts laboratory provides the setting for the personal-social developmental forms of student growth. "Man's most significant learning and development take place in a context of social interaction with other human beings" (Perkins, 1969, p. 104). In addition to the learning that takes place in such a social context, there is the important developmental task of adjusting to others that has great potential in such an environment. "One of the most significant tasks that each human being must face is that of adjusting to others. The child must learn ways of developing effective social relationships with a variety of individuals within his environment" (Dinkmeyer, 1965, p. 145).

The particular strengths of the industrial arts environment, the program and its wide range of student activities (motor, intellectual, and social) are (a) the potential for life-like experiences; (b) the nature of the program in its link to the world beyond the school; (c) the emphasis that may be given to the specific learning needs, styles, and processes of each individual; and (d) the specific attention that can be given to the developmental tasks of the learner.

CONTRIBUTIONS THAT INDUSTRIAL ARTS CAN MAKE TOWARD ASSISTING STUDENTS IN ACCOMPLISHING THEIR DEVELOPMENTAL TASKS

Industrial arts as a component of the general education for all students has its base in many significant educational dimensions that interface with the processes by which the developmental tasks may be achieved.

The bases referred to above include the following educational dimensions:

1. The content has a societal orientation with a direct relationship to the world in which the student lives and functions.
2. The industrial arts laboratory has the potential for significant contributions in the cognitive, affective, and psychomotor development of all students.

3. The range of educational involvement extends from the concrete to the abstract, from physical activity to the contemplative, and from individual to group experiences.
4. The program in industrial arts combines the physical activities with the intellectual experiences in an integrated form that provides for a limitless dimension of student involvement.
5. The program and activities in industrial arts have strong roots in the many disciplines of the school, including mathematics, communications, sociology, economics, history, science, and geography.
6. The contemporary programs in industrial arts provide the learner with important personal-developmental opportunities that deal with pride in accomplishment, a feeling of self-worth, contributing to one's peer group, becoming a "somebody," and an opportunity to explore one's unique talents.

The contributions that industrial arts can make toward assisting the students in accomplishing their developmental tasks are related to several basic assumptions.

First, the primary function of the school, and industrial arts in particular, is the *development of people*, people who can live and contribute effectively to a great democratic society so profoundly affected by industry and technology.

Second, industrial arts is an essential part of the educational *and developmental* program for all youth.

Third, the content of industrial arts centers around two important related phenomena of this and future societies. These two phenomena are (a) technology—a study of its evolution, utilization and significance; and (b) industry—a study of its organization, materials, products, processes, problems, and benefits or contributions.

Fourth, the educational program (and industrial arts in particular) can play an important role in assisting young people in the achievement of their developmental tasks.

Each of the above assumptions will have input into the analysis to follow, which is to illustrate the role industrial arts can play in this important area of human development. The developmental tasks selected for illustrative purposes are those for the early adolescent period as listed by Tryon and Lilienthal (1950). The limiting of this presentation to the tasks associated with the period of early adolescence was done in view of the space limitations for this discussion. Several of the developmental tasks will be listed with each followed by a number of activities appropriate for the achievement of, or dealing with, that particular task. (Verification of the tasks and the student activities was performed by Lucille Bowie, professor emeritus of the Institute for Child Study at the University of Maryland, College Park Campus.)

DEVELOPMENTAL TASKS AND ASSOCIATED INDUSTRIAL ARTS INVOLVEMENT BY THE STUDENT

The presentation that follows is centered around a series of headings that have a direct relationship to the developmental tasks at the early adolescence level. Activities associated with industrial arts are listed under each developmental task. These activities illustrate the kinds of student involvement industrial arts can provide in the process of assisting the student in achieving the identified developmental task.

Decision-Making and Reasoning Developmental Activities

The student

- makes decisions about things to make in class.
- decides on materials or processes to be used.
- identifies alternative materials and processes to be used.
- selects a role in the personnel organization of the class study.
- establishes standards of performance for him- or herself as well as for others.
- engages in problem solving related to concerns growing out of class activities.
- makes decisions in association with his or her role in the class personnel organization.
- defends the selection of a particular material or process.
- defends the personnel organization chart for the conduct of a group or line production project.

Controlling and Using a New Body Developmental Activities

The student

- engages in such activities as hammering, sawing, planing, chiseling, and filing.
- performs such functions as lifting, carrying, holding, and transferring materials without the assistance of others.

- engages in arranging, sorting, placing, selecting, manipulating, pushing, and pulling operations.
- engages in fine muscle activities, such as drawing, sketching, writing, tracing, erasing, carving, etching, tooling, chasing, and decorating.
- engages in large muscle activities, such as lifting, carrying, holding, and transferring materials in association with others.
- works with mechanical devices or equipment performing such activities as turning, twisting, controlling, adjusting, manipulating, pushing, pulling, guiding, feeding, placing, and holding.
- performs such processes as rubbing, polishing, sanding, brushing, wiping, and scraping.

Establishing Independence From Adults Developmental Activities

The student

- selects areas of study to be pursued in the industrial arts class.
- selects a project or a technological development to be constructed.
- investigates sources of information for his or her project independent of the teacher.
- leads a unit seminar.
- plays a leadership role in the personnel organization of a business or line production activity.
- makes independent decisions about processes and tools to be used in the construction of a project.
- serves on a board of directors of a student personnel organization in a group project study of industry or a line production activity.
- makes plans for projects or activities associated with leadership roles.
- makes limited requests for assistance on a project or problem from the teacher.
- plans and carries out increasingly larger parts of the industrial arts activities and requirements independently or with peers.
- joins with others in the formulation of and carrying out industrial arts activities related to group project studies of industry, unit studies, research and experimentation activities, and actual production enterprises.
- pursues work on project development with a minimum of consultation with the teacher or other adults.

Behaving According to a Shifting Peer Code Developmental Activities

The student

- performs leadership roles in class activities such as those related to a unit approach, a group project study of industry, or a line production activity.
- helps others in the performance of their work on projects, assignments, or reports.
- joins with others in attempting to arrive at solutions to problems growing out of the industrial arts activities.
- participates in role activities related to various management responsibilities in the personnel organization of a group project or line production activity.
- engages in peer evaluations related to problems and progress in carrying out industrial arts activities.
- relies on peers or fellow students for assistance with work on problems regarding information sources, tools or equipment to be used, things to do, or procedures to follow.
- assists others in the development of their projects, displays, or constructional activities.
- assists others in carrying out their management or worker roles in a group project or line production activity.
- performs a leadership role in the management of class activities, as well as the management of a line production enterprise or a group project.
- leads a class discussion on management or labor functions in industry.

Student Acceptance of One's Self As a Worthwhile Person Developmental Activities

The student

- volunteers for leadership roles in the personnel organization of a group project or line production activity.
- assists other students in planning, developing, and constructing their projects.
- describes various personnel achievements in the pursuit of a project or a role in the personnel plan of organization on a group project or line production activity.
- leads a unit seminar.

- presents to the class or visitors to the laboratory the processes, characteristics, or usefulness of items he or she has made.
- takes on roles or assignments working with others on group projects, line production activities, or unit studies.
- receives assistance from fellow students in the planning, researching, or constructing of his or her projects.
- plays roles that will enable him or her to assist others in carrying out their tasks or assignments.
- volunteers to share experiences, information, or materials with other students in the pursuit of their projects or class assignments.

Moving From the Concrete to the Abstract and Applying General Principles Developmental Activities

The student

- generalizes regarding his or her concrete experiences in the industrial arts program with reference to such concepts as interchangeable parts, mass production, line production, automation, process organization, management organization, productivity, industrialization, technology, technological impact, and so forth.
- develops ideas and rationalizations regarding the problems and contributions of a society dominated by industry and technology.
- defines terms associated with the study of industry and technology.
- explains the results, products, and happenings associated with the development and function of industry.
- uses the experiences of the industrial arts laboratory to provide a background for verbal explanations and interpretations related to incidents, events, and actions common to an industrial-technological society.
- discusses in abstract terms those understandings and perceptions that result from the concrete and realistic experiences of the industrial arts laboratory.
- uses language effectively and fluently as he or she discusses the firsthand experiences of the industrial arts laboratory.
- explains and identifies causal factors associated with such items as quality of products, union movements, increased pollution, product costs, and labor requirements.

Language and Communication Developmental Activities

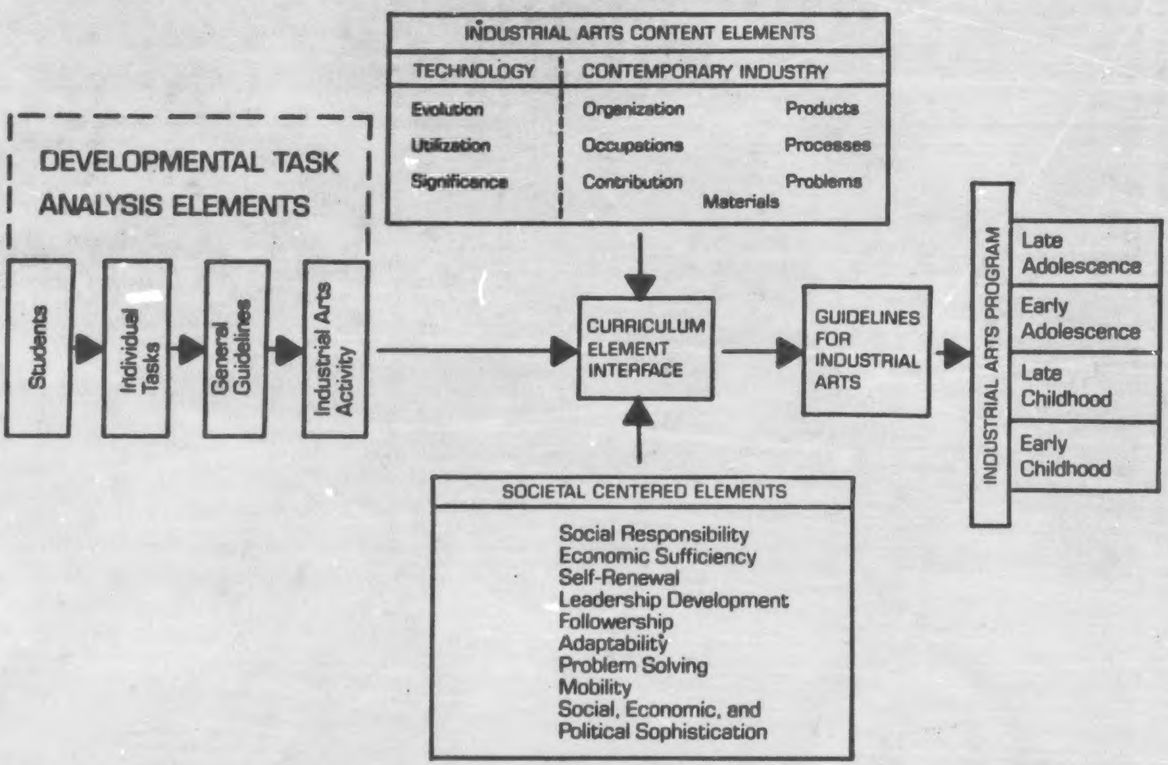
The student

- describes the complex relationships with respect to industrial, business, or technological organization.
- describes the processes and problems associated with modern industry and technology.
- discusses ideas or concepts related to the products and/or contributions of industry and technology.
- discusses the development of industry and technology.
- discusses the work he or she is performing in the laboratory.
- uses writing capabilities to describe, clarify, or communicate
    1. relationships with respect to industrial, business, or technological organization.
    2. processes and problems associated with the study of industry and technology.
    3. ideas or concepts related to the products and/or contributions of industry and technology.
    4. ideas or concepts related to the development of industry and technology.
- uses his or her drawing or graphic illustration capabilities to describe, clarify, or communicate
    1. relationships with respect to industrial, business, or technological organization.
    2. processes and problems associated with the study of industry and technology.
    3. ideas or concepts related to the products and/or contributions of industry and technology.
    4. ideas or concepts related to the development of industry and technology.

The process of identifying industrial arts activities associated with the developmental tasks of youth has been carried out with the levels of early childhood, late childhood, early adolescence. A graphic model of the process and the program inputs is contained in Figure 2-1.

The model was developed as the basic program structure for the Maryland State Guide for Industrial Arts (1976). It uses the three principal inputs into effective curriculum development: the individual (and what he or she is trying to accomplish), the content (elements from technology and contemporary industry), and the societal elements (those qualities society wants and needs in its people). The result of

Figure 2–1
Industrial Arts Program Developmental Model


INDUSTRIAL ARTS CONTENT ELEMENTS
TECHNOLOGY
CONTEMPORARY INDUSTRY
Evolution
Utilization
Significance
Organization
Occupations
Contribution
Products
Processes
Problems
Materials
DEVELOPMENTAL TASK ANALYSIS ELEMENTS
Students
Individual Tasks
General Guidelines
Industrial Arts Activity
CURRICULUM ELEMENT INTERFACE
GUIDELINES FOR INDUSTRIAL ARTS
INDUSTRIAL ARTS PROGRAM
Late Adolescence
Early Adolescence
Late Childhood
Early Childhood
SOCIETAL CENTERED ELEMENTS
Social Responsibility
Economic Sufficiency
Self-Renewal
Leadership Development
Followership
Adaptability
Problem Solving
Mobility
Social, Economic, and Political Sophistication

such curriculum development using this particular model is a series of guidelines for the respective developmental levels of early childhood, late childhood, early adolescence, and late adolescence.

SUMMARY

This discussion has taken a positive stand on important curriculum and educational issues.

1. To understand the behavior, conduct, and actions of youth, it is important to be aware of and understand the developmental tasks the individual is pursuing at a given time or period.
2. The school has a responsibility for assisting individuals in the achieving of their developmental tasks.
3. The integration of the activities associated with the processes through which the developmental tasks are facilitated and the hard content of the area of study provides a sound and compatible design for learner involvement in the educational process.
4. The area of industrial arts, by virtue of its content, its unique environment, and the diversity of potential learning strategies, has a significant role to play in the process of assisting individuals in achieving a number of their developmental tasks.
5. The program model and the analysis of the developmental tasks have been carried out by industrial arts personnel in their effort to put theory into practice and to demonstrate that industrial arts can be a major contributor to the processes of human growth and development.

Industrial arts has demonstrated that it can develop and carry out programs that put the emphasis on the individual and what he or she is attempting to accomplish. The enormous potential for the life-like and realistic educational involvement are present in the industrial arts program and its laboratory environment.

Just as the Model "T" has given way to the sleek new cars of today, and just as the biplane of yesteryear has given way to the supersonic jets of today, the programs in industrial arts have moved forward in new dimensions of student involvement, content enrichment, and a sense of responsibility toward helping young people grow and develop.

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Chapter 3

Industrial Arts and Its Contribution to The Education of the Gifted

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THE ISSUE

Industrial arts has three major contributions to make in the education of the gifted student. These contributions—relevant content, personalized skills, and a unique learning environment—are capable of providing answers to one of the most perplexing questions confronting American educators and school administrators: By what means shall an American democracy educate its most educable? Thus, the issue is that industrial arts has a major role to play in the education of the gifted.

CHARACTERISTICS OF THE ISSUE

The American system of education and the society in which it functions are inextricably intertwined. Literature both in and out of education is replete with data to substantiate the premise that the most prevalent and pressing problems in education at any given time are also inherent in the American culture. The creation of substantial change in education often causes an imbalance undergirding some of the most basic societal beliefs. Thus, the methods chosen to educate the educable are so very often dictated by other and more recognizable societal values. Likewise, the methods chosen to educate the gifted reflect society's traditional and yet well-established boundary lines on the role education is to serve, to whom it shall serve, and in what format it shall be served.

Gallagher (1975) noted that society establishes parameters that substantially influence the shape of education as well as its approach to defined general and special responsibilities, such as the manner in which the gifted shall be educated. The degree of societal influence is reflected in the administrative structure or package of an educational system. It is this package, rather than the contents of the package, that have traditionally been seen and reacted to by society.

Gallagher (1976) identified four parameters that strongly influence the nature of the administrative package in which programs for the gifted are administered. These parameters were egalitarianism (equal treatment and opportunity for all), universal education (satisfying the needs of all people in one learning environment), decentralization of educational decision-making (maintaining educational decision-making at the local level), and the value of competition (recognizing the merits of competition in the educational system).

Parameters such as these have caused problems for industrial arts programs in the school setting. Exemplary of these problems has been the restrictions placed on gifted students to enroll in programs that apply knowledge in an experiential environment. The bases for these restrictions are unfounded and have no sound nor accepted philosophical foundation in a technological society. Action must start in the school by administrators and guidance personnel to encourage gifted students into programs that apply knowledge.

A second problem is the narrowness by which society, specifically chief school officers, have defined giftedness. This discussion will illustrate that giftedness is multidimensional. It is not just restricted to high intellectual levels but relates to what Fliegler (1961) has also identified as giftedness.

> A high functional ability to achieve the various academic areas commensurate with general intellectual ability; a high-order talent in such special areas as art, music, mechanical ability, foreign languages, sciences, mathematics, dramatics; social leadership, and creative writing; and a creative ability to develop a novel event in the environment. (p. 16)

These thoughts closely parallel those of Witty (1961), who stated that giftedness should

> **include any pupil whose performance in a potentially valuable line of human activity, is consistently or repeatedly remarkable. (p. 36)**

Kilpatrick (1961) was even more specific. He stated that the term *giftedness* "must include not only the intellectually gifted, but all who show promise in music, the arts, creative writing, dramatics, mechanical skills, and social leadership" (p. 43).

Thus, the thesis of this discussion is that industrial arts can make three major contributions to the education of the gifted if the school officials are willing to more closely examine the needed skills of the gifted, the content required of the gifted, and the learning environment for the gifted in a technological society. Only then will it become evident that industrial arts has well-defined, relevant content or a body of knowledge (industry and technology), offers appropriate personalized learning skills (problem-solving and productive thinking activities), and provides a unique learning environment (a multisensory, experiential, firsthand learning experience) that is recognized as a basic ingredient to determining by what means an American democracy shall educate its most educable.

Personalized Skills

Industrial arts offers many opportunities to develop further the personalized skills of the gifted student. Its content and the learning environment in which it functions offer stimulation for the gifted in such skill and personal areas as discovery, divergent thinking, creativity, problem-solving, curiosity, and individuality. This first section identifies skills commonly associated with the gifted. These skills are characteristic of all gifted children. Some children, however, exhibit these skills to a lesser or greater degree than others.

Khatena (1976) noted that early studies of the gifted indicated that these people were "physically and psychologically healthier people, certainly more mature and intellectually ahead of their agemates, excelling in most human and educational activity" (p. 123). Later studies, such as those conducted by Guilford (1967), found that there were qualitative differences in the intellect that included divergent thinking. The impact on education in the United States of studies by Guilford and others has been far reaching: (a) the identification of an abundance of educational opportunities for the gifted person through greater efforts on the measurement of intellectual abilities, and (b) the stimulation of research in identification, nurture, and concomitant problems.

The literature contains considerable evidence indicating that if only one skill could be identified as the trademark of the gifted, it would be creativity. This view is supported by Passow (1976), who viewed creativity as "an integral component of gifted behavior—that giftedness is only manifested when it includes an element of creativity" (p. 151). Torrance (1974b) viewed creativity as a process. The creative person desired training in the further development of skills in searching for solutions, formulating hypotheses, recognizing difficulties and obstructions to solutions, and sensitivity to problems and gaps in knowledge.

Khatena and Torrance (1973) reported still another skill that was related to giftedness, and that was imagination. The gifted person displayed skill in restructuring ideas and thoughts into meaningful associative bonds. Gowan and Bruch (1971) stated that gifted students desired skill development that allowed them to challenge and raise questions, particularly about values, morals, and concerns. The gifted student displayed skill in the "intellectual excitement of creative explorations and productions" (p. 2).

Malone (1975) identified the gifted student as one who constructed a value system early in life and made a more intense search for meaningfulness. Gifted students also showed skill in trying out ideas, values, and social attitudes on a peer group and had a keen perception of the attitude of those around them. Malone and Moonan (1975) compared the gifted to the nongifted and found that gifted people were more skilled in the areas of abstract thinking, perceiving cause and effect relationships, and projecting ideas into the future.

Williams (1953) addressed the needed skills of the gifted person as that of individuality and the importance of the child learning more and more about himself or herself and about the society in which he or she functions. Torrance (1974a) reinforced William's thoughts by indicating that the gifted student will more easily accept his or her unusualness (individuality) and not be psychologically disturbed by it.

Foshay (1961) indicated that gifted people expressed greater degrees of skill in associating items of knowledge, seeking new experiences, and alternating between openness and focusing on experiences. Hildreth (1966) stated that gifted people sought skill development that would allow them to develop further self-directed learning, gain greater independence in problem-solving, and seek answers to complex problems not envisioned by their agemates.

It is evident that the research reported in the literature in the past twenty years clearly indicates that giftedness means much more than students who have a high intellectual level. There are identifiable personalized skills associated with the gifted that all programs in a school setting should strive to develop. These skills are summarized in Figure 3-1.

Personalized Skills Associated with Gifted Students

Discovery
Divergent Thinking
Creativity
Problem Solving
Curiosity
Individuality
Searching for Solutions
Formulating Hypotheses
Recognizing Difficulties
Sensitivity to Problems
Filling-in Gaps in Knowledge
Imagination
Restructuring Ideas
Raising Questions
Constructing a Value System
Trying Out Ideas
Perceiving Cause and Effect Relationships
Projecting Ideas into the Future
Seeking New Experiences
Seeking Answers to Complex Problems
Originality
Debating
Eagerness to Learn
Self-Evaluation

Figure 3-1. These are the personalized skills associated with all gifted students. All school programs should play a part in developing these skills.

Learning Environment

The industrial arts classroom and laboratory is a unique educational setting that provides for optimum learning for students, particularly the gifted. The industrial arts learning environment offers a unique mixture for total interaction among students and teachers, as well as the tools, materials, and facilities and a range of human interaction to achieve the instructional objectives. The following section is an overview of the characteristics of an optimum learning environment with emphasis on grouping gifted students, establishing learning facilities, and identifying ideal teacher characteristics for the gifted program.

Fox (1977) stated that the gifted need to be grouped with respect to their interests and specific skills and not necessarily just according to intelligence. Esposito (1973) reinforced the need for homogeneous grouping and indicated that levels of achievement improved when accompanied by appropriate methods of content and instructional techniques in an educational setting. Grouping reinforces and enriches the opportunities for students to develop further their uniqueness apart from other individuals of differing human traits.

Malone and Moonan (1975) noted that the gifted needed to be grouped with their true peers so that they can relate to one another. Without grouping, gifted students will be "forced to decide whether or not they will persist in their differentness or if they will model their behavior after that of the majority of the other children" (p. 302).

The importance of true peer interaction has been reported by Kurtz and Swenson (1951), Terman (1959), Meeker (1969), and Gowan and Bruch (1971). Their research support the need for grouping the gifted in a common learning environment and the necessity (a) for intellectual interaction to stimulate their uniqueness; (b) for differential curriculum experiences to accommodate different learning styles; and (c) to stimulate and maintain a positive self-concept.

The role of the learning environment is not just to serve as a place for the dissemination of knowledge; its meaning is much greater and more far reaching. Its role is to contribute to one of the primary purposes of education—to help people become better human beings (Drews, 1975). The learning environment must also contribute towards one of the basic fundamental processes of education and that is to help people learn how to learn. The environment should be permeated with a creative atmosphere. Vernon, Adamson, and Vernon (1977) reported that the learning environment (classroom and laboratory) must provide for enrichment, and it must have an excellent library, audio and visual aids, equipment, and a diversity of facilities easily accessible to the students and teachers.

The third factor that influences the learning environment is the role of the teacher and how he or she interacts with the gifted. The industrial arts teacher serves in a unique learning environment to foster the creative abilities and talents of the gifted. The teacher of the gifted does not need to be a disseminator of knowledge and unrelated facts but rather needs to be a facilitator of learning and a source of inspiration (Drews, 1975). The teacher of the gifted needs to be capable of asking the trenchant question, offer new and alternative ways of viewing a problem, and promulgate a positive self-image among students.

Boston (1975) identified several characteristics of a good teacher of gifted students. Among these characteristics were self-confidence, enthusiasm for teaching, love of learning, flexibility, and creativity. Isaacs (1966) noted that only when the teacher of the gifted is placed in the proper learning environment can he or she skillfully and creatively individualize subject matter, a necessary teaching attribute when interacting with the gifted.

The learning environment should provide ample opportunities for the teacher and student to try out ideas and to experiment, whether their endeavors meet with success or failure. Renzulli and Callahan (1975) indicated that the learning environment should allow for brainstorming, for creativity training, both of which imply a significant and meaningful role for the teacher.

The preceding discussion has provided evidence that a unique learning environment is not only desired, but required for the gifted. A separate room where gifted students go for one or two hours a day is not the answer to the needed learning environment, nor is a curriculum effort that allows the student to conduct a special problem the answer. The answer to the issue of environment is a well-developed and organized situation that allows for grouping of people with similar abilities and interests, a well-equipped classroom and laboratory that promotes and stimulates the students' natural curiosity and allows them to refine their talents, and a teacher that views him- or herself not as the fount of knowledge but as a facilitator of learning.

Figure 3-2 summarizes the three ingredients to the issue of the learning environment: organizing students, establishing facilities, and good teacher characteristics.

Relevant Content

The importance of studying the content (industry and technology) offered by industrial arts programs is unquestionable for it is this content that constantly influences the American way of life, past, present, and future. The gifted, most likely the future doctors, engineers, scientists, decision-makers, and leaders, will be influenced by and have an impact on future industrial and technological developments. These students will not only be the prime beneficiaries of these developments, but will most likely be the ones who solve major future industrial/technological problems in the 20th and 21st centuries.

The general nature of the body of content for the gifted is the same as that for the nongifted. The differences, however, lie in the depth and diversity of study the gifted student pursues in learning more about industry and technology. For example, all people need to possess an understanding of those human endeavors involved in creating and using tools, techniques, resources, and systems as extensions of the human potential.

Gifted people, because of their natural curiosity, desire for independence, individuality, and other human traits, will pursue the study of technology to greater depths and in different dimensions as

Ingredients of a Learning Environment

ORGANIZING STUDENTS

1. Homogeneous grouping by intelligence, interests, and skills.
2. Opportunities for enrichment.
3. Student interaction.
4. Differential curriculum experiences.

FACILITIES

1. Develop better humans through excellent library, audio and visual aids equipment and materials, excellent equipment and tools, and planning center.
2. Provide for creative atmosphere.

TEACHER CHARACTERISTICS

1. Facilitator of learning.
2. Promote positive self-image.
3. Offer ways of viewing a problem.
4. Self-confidence.
5. Flexibility.
6. Creativity.
7. Individualize subject matter.
8. Know and apply a diversity of teaching methods.

Figure 3-2. The issue of the learning environment involves organizing students, establishing excellent facilities, and developing good teacher characteristics.

they study its evolution, use, and significance. Similarily, all people need an understanding of that societal institution (industry) that uses resources to produce goods, services, and information to meet the needs and wants of individuals and society. The gifted, however, are more curious about industry and its organization, personnel, systems, techniques, resources, and products and their social/cultural impact.

Commensurate with the body of content (industry and technology) is the delivery system used to develop skills (divergent thinking, creativity, problem-solving) in an appropriate learning environment. The delivery system implies a method used to study the content and to develop the necessary skills. Maximum learning occurs when the delivery system promotes human potential while studying relevant subject matter that increases his/her social/cultural understanding.

REVIEW OF THE LITERATURE

This section focuses on two parts—a review of the literature concentrating on the gifted child movement and a summary of commonly accepted terminology associated with the identification of the gifted person. The literature in both of these areas is voluminous; therefore, the following paragraphs shall serve only to provide the reader with an overview in both of these areas.

Gifted Child Movement

The development of a system of education in the United States for the gifted child consists of periods of accelerated interest with accompanying research studies followed by periods of little or no development. These periods are marked with a change in emphasis from child prodigy to scientific measurement through testing of mental traits and abilities. The latter period was promoted by the humanistic psychology movement with emphasis on individual differences. Each period in the gifted child movement, however, was nurtured through the efforts of several leading psychologists and educationists.

One of the first permanently recorded efforts to encourage gifted people in the United States was the work of Thomas Jefferson in a proposed bill before the Virginia legislature called A Bill for the More General Diffusion of Knowledge. Jefferson, concerned about the leadership that was being required in this new land called the United States, proposed a system of education at public expense for promoting young people to enter a university. Jefferson proposed that tests of a vigorous nature be administered at the grammar school level to identify possible "geniuses." He believed that if these geniuses were not identified at an early age, their talents would be wasted and permanently lost to the country. Although the bill was never passed by the Virginia legislature in its original form, his initial efforts are noteworthy in the early gifted child movement in the United States.

Child Prodigy. Child prodigy, the talents of the child wonders, has always caught the curiosity of the American public. Literature from the early 1800s up to the present is replete with varied accounts of children with exceptional talents and achievements. Hollingworth (1926) documents numerous child prodigies in the United States. In general, society continues to consider the child prodigies as abnormal, freaks, and "out-of-the-ordinary" young people, although psychologists and educationists view them as special people with abilities far exceeding their age-mates.

Humanistic psychology. Interest in the gifted child grew rapidly with the movement toward humanistic psychology and the scientific measurement of the mental traits of the gifted individual. Before this time, however, the method of identifying gifted children was the child's observed performance in society.

The earliest scientific work in the United States was that of Lewis Terman and was reported in 1906 in his publication *Genius and Stupidity*. Terman advanced some of the early work in developmental psychology of the French psychologist Alfred Binet by adapting the method of measuring intellectual development of the gifted child. Gowan (1977) summarized the early efforts of Terman in measuring intellectual developmental progress by stating that Terman was able to determine that the "chronological age represents a ratio less than 1 in the case of the above-average child" (p. 11). Terman multiplied the rate of intellectual development by 100 and called it the intelligent quotient (IQ). Further work by Terman resulted in the Stanford Revision of the Binet-Simon Scale, which allowed a more accurate method of identifying gifted children.

Other efforts during this time frame are credited to William Stern and Guy M. Whipple (Hildreth, 1966). Stern is credited with computing the ratio of mental age to actual age and by doing this, obtained a quotient for intellectual status. Whipple's contributions focused on the use of mental tests as measures of both mental maturity and intelligence. These three researchers—Terman, Stern, and Whipple—provided a major impetus in the realization that the child prodigies were not abnormal but were simply unusually mature for the chronological age.

In 1921 the Commonwealth Fund awarded Terman a $20,000 research grant that was to initiate a long series of investigations into gifted children. This longitudinal psychology study was first reported in 1927-28 and later reports followed in 1945 and 1955. The Genetic Studies of Genius (Terman, 1959), which contained five volumes, grew out of Terman's study. The five-volume edition revealed information important to the characteristics of gifted children.

1. There are very few commonalities among gifted children, and stability of the IQ is one of them. Thus, gifted children constitute a heterogeneous group of people in terms of their traits.
2. The most valid method of identifying the most intelligent child was to identify the youngest in a class. Teacher nominations or selections are not valid measures.
3. Student acceleration at all grade levels is recommended wherever possible.
4. The superiority of intelligence is maintained throughout life, and the father's education and socioeconomic status are

important factors in identifying differences within a group of gifted children.

Concurrent to the developmental work of Terman and others, there occurred in the United States several educational experiments with gifted children. These experiments ranged from separate schools for the gifted to special classes in the regular schools and from individualized instruction to limited use of uniform curricula and standardized texts. These early efforts, however, were constantly confronted with identifying "who are the gifted." With the advent of World War II, the National Society for the Study of Education (NSSE) devoted several yearbooks to the concern for the gifted child. The NSSE yearbooks of 1920, 1924, and 1940 are specific examples.

The period after World War II witnessed many changes in American society. Foremost among these was the rapid technological change, a rising standard of living, and a complex American society. Educationists were confronted with designing an educational system to prepare people to cope with future conditions that they could not readily comprehend or understand.

The launching of the Russian's Sputnik in 1957 sparked a new interest and more extensive emphasis on the identification and training of capable children in the scientific areas. American education was being criticized from all directions. Rickover (1963) urged educational leaders to return to the basics, and others urged more attention to be given to the development of the creative talents and imaginative and productive abilities. Although emphasis was still on measuring the child's mental traits and abilities, increased emphasis was being placed on creativity, ambition, divergent behavior, interests, and invention. Vernon et al. (1977) labeled the period of the 1960s as providing the "most favorable climate of the twentieth century for special education of gifted American children" (p. 11).

Other examples of increased concern for the gifted child in the 1950s and 1960s were the large number of publications, extensive research, increased financial aid for studying the gifted, and the efforts of concerned national associations and organizations. In the publication *An Annotated Bibliography on the Academically Talented Student*, Gowan (1961) identified more than 800 references on the gifted and talented child. Other publications were being promulgated, and many were being sponsored by the United States Office of Education (USOE).

In 1958, the National Defense Education Act provided financial support for teaching in the science areas. Guidance and counseling services received increased funding. National associations were founded for the purpose of placing increased emphasis on the needs of the gifted. Among these associations were the Association for the

Gifted, National Association for Gifted Children, the Association for the Gifted, National Association for Creative Children and Adults, the Council of State Directors of Programs for the Gifted, and Gifted Children Research Institute.

In 1961, the USOE formally recognized the needs of the gifted by employing a specialist in this area. The purpose of the specialist was to develop training materials and programs for the Division of Elementary and Secondary Education. Under the reorganization of the USOE in 1964, however, emphasis on specialized areas was eliminated. It was not until the United States Congress expressed concern and interest that a landmark addition to the Elementary and Secondary Education Amendments of 1969 was passed. The amendment, particularly Titles III and V of the Elementary and Secondary Education Act of 1956, provided changes in existing legislation that the gifted and talented student should benefit from such legislation. Public Law 91-230, Section 806, may be consulted for a detailed description of the legislation.

Sidney P. Marland, as the United States Commissioner of Education, submitted a report to Congress in 1972 that documented the special needs of the gifted and talented and summarized research related to the education of the gifted. Today, there is an Office of Gifted and Talented (OGT) in the Department of Education. The OGT advocates and promotes research activities for the gifted and coordinates these activities through the Department of Education Resources.

Identifying the Gifted

One of the most perplexing tasks facing educationists today is developing a set of criteria to identify who are the gifted. The complexity of the task is heightened by a multitude of definitions and the resulting implications from these definitions. In addition, the personal, physical, mental, and psychological differences among people significantly compounds the problem of identification.

The preceding section in this review of literature emphasized the stress that has been placed on intelligence tests in working with gifted people. Understandably, then, intelligence tests have been given an inordinate amount of attention in identifying who are the gifted. These tests have focused on identifying people of superior intelligence when compared with people of the same chronological age. These standardized tests of intelligence focused on the child's level of cognitive development when compared with his or her agemates. As early as 1927, Thorndike (1927) focused his efforts on identifying criteria for intellectual capacity. He concluded that the altitude of the mental tasks and skills one was capable of learning and performing was the most important criterion.

Although intelligence tests continue to be the most reliable and valid measures for identifying mentally exceptional children, abnormally intelligent children, or the superior child, there are several factors against restricting the identification process to intelligence tests alone. Although intelligence tests provide a clearly defined measurable criterion (i.e., cut-off score), the intelligence test score measures only conceptual thinking and mental functioning. Conant (1959) would use intelligence tests to identify the 2 to 3% of the high school population in identifying the highly gifted people.

Today, educationists view the use of intelligence tests alone as providing too narrow a criterion for identification purposes. The gifted child is multidimensional and thus requires measures that are multidimensional. Gifted children have more than just a high IQ, they exhibit unusual performance in creative expression and imagination (Sumption & Luecking, 1960); they possess outstanding talents and aptitudes and these can be stimulated (DeHaan & Havighurst, 1961); they display unusual abilities and superior capacities when compared with their age-mates; they are able to analyze the present and prognosticate for the future; they question things as they are; they are inventive and imaginative; they are more educable than their age-mates (i.e., they are more capable of benefiting from advanced educational studies and experiences; they exhibit high degrees of self-discipline and motivation; and they are capable of learning at an accelerated rate (Martinson & Lessinger, 1965).

Vernon et al. (1977) recommended several different types of measures when attempting to identify the gifted. These measures included intelligence tests, creative tests, special aptitude tests, parental information, teacher nominations, and personality tests. This multidimensional approach was reinforced by Cattell and Butcher (1968) when they recommended that cognitive, personality, and motivation tests as being superior to just cognitive tests in predicting scholastic achievement.

The preceding discussion has provided evidence that the process chosen by school personnel to identify the gifted must involve more than just intelligence tests and must include an array of measures. These measures must at least provide indicators of levels of intellectual capacities, creative expression, perception, spatial orientation, language, psychomotor control, practical problem solving, and abstract reasoning behavior. The gifted child possesses an assortment of special talents and displays these talents in a superior manner when compared with his or her age-mates. This view of the gifted person, and the one accepted as the basis for this discussion, rejects Laycock's (1957) definition that giftedness pertains only to intellectual capacity. When the training of talent is accompanied by the mastery of theoretical aspects relating to that talent, then talent in its multidimensional form must be an integral part of identifying the gifted.

CONTRIBUTIONS OF INDUSTRIAL ARTS TO THE GIFTED STUDENT

The preceding sections outlined some of the common and generally accepted understandings about the gifted student. It is evident that any school program designed for the gifted must in fact be a special program. Industrial arts has had such a special program, and this final section identifies specific contributions industrial arts makes to the education of the gifted student.

Personalized Skills

The personalized skills required of the gifted student are the same as those for the non-gifted. The difference, however, lies in the degree, diversity, and intensity of development of these skills. Their development involves a teacher who views learning as a process and his or her role as the facilitator of that process. The skills cannot be finely tuned in a classroom where a student is required to sit for eight hours and regurgitate facts from a textbook or memorize numbers and formulas from a chalkboard. The skills can only be developed when the opportunities exist for the student to apply the known into the field of the unknown. Here, the key word is *apply*, for it connotes special meaning to the educational process. To apply that which is known to the field of the unknown demands an array of teaching methodologies. It implies that the teacher views the learning process as occurring in the classroom, in the laboratory, and in the community. It implies that the teacher knows how to develop skills in creativity, divergent thinking, problem-solving, searching for solutions, curiosity, testing hypotheses, imagination, perceiving cause and effect relationships, and self-directed learning. This, no doubt, requires not a new teacher but a teacher with a different view of the educational process.

Industrial arts has made great strides in the area of personalized skill development, and its successes are well known in educational circles. Exemplary of these successes has been the work of Maley (1973) in the Department of Industrial Education at the University of Maryland. His work, and that of his colleagues and students, has promoted the concept that industrial arts provides a mixture of the best educational theory and practice. Since the early 1950s, principally through Maley's efforts, industrial arts continues to provide a widely acclaimed program for gifted students. It is a program of enrichment fitted to the unique needs and interests of students. It teaches students how to learn while taking into consideration their developmental tasks. The program, entitled "Research and Experimentation," has been used with great acceptance at the junior high, senior high, and university levels (Martin, 1975).

Industrial arts programs that develop the personalized skills required of the gifted student have exhibited the following characteristics:

1. Heavy emphasis is placed on problem-solving activities (e.g., library research, testing materials and processes, and building apparatuses).
2. The programs allow students to conduct quality research, to experiment, to try out ideas, and to conduct investigations through the scientific inquiry method (e.g., states a problem and develops a solution and sometimes alternative solutions to the problem).
3. The programs permit students to work with their gifted peers, to ask questions, to report, to challenge, to self-evaluate and to evaluate others, and to work independently of other persons, both in and out of the school (e.g., self-directed student seminars and field trips to gain firsthand knowledge about a topic).
4. Opportunities are made available for students to seek new experiences; to test hypotheses using tools, materials, and equipment; and to fill in gaps in knowledge (e.g., using wind tunnels, numerical control, computers, and forming processes in an experimental mode).
5. Activities encourage students to develop their imagination, curiosity, and creativity in the solution of a societal problem (e.g., students research and then build a testing apparatus in the process of finding a solution to a major societal problem).

Learning Environment

Industrial arts continues to offer the most unique learning environment in the school setting. It is an environment that allows the students to apply, test, and experiment with a variety of industrial tools, materials, and equipment. The industrial arts facility is a learning haven for studying one of the most important and needed cultural understandings in our society—a knowledge of industry and technology.

Industrial arts facilities are a mixture of unit and general laboratories. There is no reason why these same facilities cannot be used to develop skills and content required of the gifted student. Although unit laboratories offer some restrictions, the general laboratory provides an ideal facility. The general laboratory has an assortment of tools, materials, and machines to develop the varied interests of the student. The ideal industrial arts laboratory, however, is one that is especially suited for the gifted student. It contains testing equipment, a seminar room, a library, a planning center, and a storage area. As the basketball court is to the athlete and the greenhouse is to the botanist, a quality industrial arts facility is to the technologically gifted student.

There are several such exemplary facilities across the United States. At the University of Maryland a separate research and experimentation laboratory exists for preparing industrial arts teachers. In the Montgomery County Schools of Maryland, several such facilities exist at the junior high school level, in Cleveland Heights, Ohio, a materials testing laboratory exists in the industrial arts program (Waitkus, 1975).

Industrial arts programs that provide a unique learning environment for gifted students have exhibited the following characteristics:

1. There has been acceptance by teachers, school administrators, and parents that a special industrial arts facility for gifted students is required (e.g., a room that is not only identifiable but allows the development of the personalized skills of the gifted).
2. The facilities promote intellectual interaction in both the seminar room and laboratory (e.g., students conduct formal meetings to assist one another in presenting topics, asking questions, and offering constructive criticism).
3. The facilities allow industrial arts teachers to develop the creative abilities and natural curiosity of the students (e.g., the teacher challenges the students through a multitude of teaching methodologies available to him or her).
4. The programs develop self-confidence in students (e.g., students conduct independent projects, operate machines and use tools, role play, and serve as a group leader of a seminar).
5. The facilities allow for grouping of students with common talents (e.g., students with similar intellectual levels, high levels of performance in creative expression and imagination, high degrees of self-discipline and motivation, and students that learn at an accelerated rate).

Relevant Content

The third major contribution industrial arts has to offer the gifted is a body of relevant content that is enriched with basic and fundamental cultural understandings for all humans—the study of industry and technology. Only the misinformed can argue that developing a better and more complete knowledge of industry and technology has no place in the 20th century educational system. Industrial arts unique position in the American educational system allows it to offer something that no other subject matter can claim: the opportunity to interface the best-known and accepted learning theories and practices in a supervised, well-planned, and organized educational setting with a rich and relevant content.

Content for industrial arts programs for the gifted students has exhibited the following characteristics:

1. The content focuses on the student self-selecting an important industrial/technological problem in society and conducting research on that problem. For example, a student selects a research problem that society has expressed a need to have solved. A student may study the effects of vehicle hydrocarbons on the atmosphere, the effects of noise pollution from industrial machinery on factory workers, and the effects of household detergents on clothing; can compare lead and unleaded gasoline; or can compare different name brands of paint for their weather resistance. The problems are of an industrial/technological nature but are student self-selected, self-directed, and self-studied.

2. Students study content areas not traditionally found in the school setting (e.g., rubber, petroleum, salt water, concrete, asphalt, adhesives).

3. The content allows for an interdisciplinary involvement by students, faculty, and community. For example, students write reports with the aid of the English teacher, students interview experts in industry, students conduct research in the library with the help of the librarian, and the science teacher helps the students with the methods of scientific inquiry.

4. The content requires that the student design and build a testing apparatus (often referred to as a project in traditional industrial arts programs) to solve the research problem. The student develops manipulative skills, studies different construction methods, and learns about new materials, processes, and products.

SUMMARY

The industrial arts program has an important role to play in the education of the gifted. There have been numerous exemplary programs with convincing records of accomplishment. The most common detriment to a greater degree of use of industrial arts in educating the gifted is the lack of understanding of the potential in the program. School officials, curriculum leaders, and counselors would do well to examine the merits of industrial arts.

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Chapter 4

Industrial Arts and Its Contribution to The Education of the Disadvantaged

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They are found in all parts of America—in urban schools, in rural settings, in the suburbs. Their specific situations vary—native language other than English, cultural background different from the middle-class heritage of the schools, lack of parental and peer support for education, lack of experiences that prepare them for the regular school curriculum. "They" are the so-called disadvantaged learners. And in most schools their problems can be distilled into a single issue: They are unable to succeed in regular educational programs because they receive no support in their out-of-school environment. As a result, these students too often have neither the academic nor technical skills to continue their education or to become gainfully employed.

THE ISSUE

Examination of issues that confront both students and teachers of the disadvantaged reveals two significant findings. First, industrial arts education has virtually unlimited contributions to make in teaching disadvantaged learners. Second, potential resources of industrial arts have not been fully used.

What are the unique contributions of industrial arts? One important, often overlooked, element is that industrial arts is a traditional member of the general education curriculum. This means that most students enroll in industrial arts sometime in their elementary or secondary school experiences. The potential is great to employ cooperative activities using the resources of both industrial arts and academic offerings.

A second element is that the industrial arts curriculum frequently incorporates aspects of career education. Laboratory experiences provide career orientation and exploration activities at a critical point in the student's development.

Another contribution is that curriculum development efforts in industrial arts in the past 20 years have created more choices for teachers in choosing appropriate methods to meet the needs of differing groups of students. These methods range in topic from the development of technology (Maley, 1973) to prevocational skill acquisition (Lux, 1979).

Motivation is a fourth contribution of industrial arts to the teaching of disadvantaged learners. When properly orchestrated, industrial arts activities ensure student success and provide positive feedback to learners. The curriculum can also be used to arouse student interest. For example, industrial arts teachers can provide activities that help disadvantaged students build positively on their ethnic and cultural backgrounds. Success, feedback, and interest add up to motivation for students toward learning—motivation that often transfers to other school subjects as well.

Perhaps one of the most important contributions of industrial arts is the consistent involvement of the three major learning domains: cognitive, affective, and psychomotor. Industrial arts activities emphasize cognitive skills for communication, mathematics, and science applications. The affective domain comes into play as learners work together toward common goals, examine value-laden situations, and develop new interests. Psychomotor skills are developed when students work with tools and machines in the industrial arts laboratory. Students who are traditionally weak in the cognitive area often benefit greatly from the opportunity to develop and apply their psychomotor and affective skills to cognitive learning.

CHARACTERISTICS OF THE ISSUE

There are some individuals, educators included, who perceive the term *disadvantaged* as having negative overtones. Others react to the term positively. This second group of teachers consider the term not as a stereotype but as a signal that the student needs help in overcoming academic deficiencies.

Just who are these learners with special needs, the disadvantaged? Their "disadvantagement" is not the result of a physical or mental handicap. The disadvantage is environmental in nature, and the common denominator in most cases is poverty. Although being poor is not limited to any group of people, it is most frequently concentrated in areas of racial and ethnic minorities. It is in these areas where opportunities are least and economic depression greatest.

One of the most populous groups of those termed disadvantaged are Blacks. Concentrated in the cities of the North and rural areas of the South, their average salaries and education levels are low, and rates of unemployment are correspondingly high.

Hispanics are a second group of the disadvantaged that is large and growing rapidly. This group consists mostly of Chicanos in the West and Southwest, Puerto Ricans in the Northeast, and Cubans in Southern Florida. Many suffer not only from an inadequate economic level, but also from a discrepancy in language and culture between home and school.

Native Americans also experience the problems encountered with differences in language and culture from those of the larger society. To compound their situation, Native Americans generally live in rurally isolated areas, geographically cut off from the mainstream of society—the mainstream that is the educational "norm."

The wars in Southeast Asia since the 1960s have produced an ethnic group that is disadvantaged by virtue of differences in language and culture. During the 1970s increased numbers of Indochinese refugees emigrated to the United States. Many refugees are unemployed and lack education or skills, thus placing them in a disadvantaged situation.

The final major group of disadvantaged Americans are neither racial nor ethnic minorities. Pockets of poor, isolated by geography and cultural differences, are found nationwide. Perhaps the highest concentration of this group are the mountain people in Appalachia and the Ozarks.

Specific Issues Confronting Students and Educators

Although the disadvantaged vary greatly in their ethnic and racial background and their geographic location, the specific issues that confront disadvantaged learners and their teachers are remarkably similar. There are the problems already mentioned: cultural differences, limited language abilities, and the geographic isolation that leads to lack of broad experience. These problems breed additional ones: low self-concept, low academic achievement, and low career aspirations.

Cultural Differences. The academic problems of the disadvantaged do not result from a *lack* of culture. The problem comes from growing up in a culture that is *different* from the dominant society. Native Americans on rural reservations have a definite cultural heritage, one that is extensive and well established. But their culture is not that of the dominant American society, and it is that broader culture on which the schools are based. The same holds true for the other racial and ethnic groups that are common among the disadvantaged. Students from these backgrounds end up being *bicultural*, which can result in role confusion and a lack of a clear-cut self-identity.

Limited Language Development. Difficulty with language is a problem that frequently confronts the disadvantaged learners. Two aspects of the problem are common. One is a difference in language—Hispanics, Southeast Asians, and Native Americans may grow up in homes where a language other than English is spoken. Even if these learners speak English, their progress in school is often impaired. Other disadvantaged students speak an ethnic English dialect that inhibits their communication in the standard English of the schools.

The second language difficulty is a lack of general communication skills. Some students do not communicate well in *any* language. They do not speak well, and they lack skills in grammar, spelling, and writing. In short, these students are impeded academically because their general language skills are not well developed.

As might be expected, many students suffer from both types of limited language development. They come from non-English speaking homes and do not have adequate communication skills in either their native language or in English.

Lack of Variety and Depth of Experience. Most disadvantaged learners are geographically isolated. They not only live surrounded by others from the same subculture, but they seldom have the opportunity to travel beyond their home area. Some, like the Northern Blacks and Puerto Ricans, are isolated in urban areas. Others, notably Native Americans on reservations and the mountain peoples of the Southeast, experience a rural isolation. In both cases, the consequence is a lack of opportunity to share in the types of experiences common to most Americans. Thus, they are missing much of the background taken for granted in the regular school curriculum.

Low Academic Achievement. The inevitable result of students raised in a unique subculture with limited experience and difficulty with language is a lower than average academic achievement. Disadvantaged learners often do not receive much support from their families and friends to succeed in school. In some cases, academic success is discouraged, even ridiculed. Small wonder these students are not motivated towards their classes or know little about how to succeed in school.

Low Self-Concept. As disadvantaged learners proceed in school, they often get caught in a no-win situation—the more they fail academically, the worse they feel about themselves. Their negative self-concept is often compounded by being outside the cultural mainstream. The result is that they become confused about their role in society. Their reduced self-concept further blocks their chances for academic success.

Low Career Aspirations. In addition to their low academic achievement and low self-concept, disadvantaged students often have low career goals. Why? A lack of appropriate role models in professional and technical careers may be one reason. Another is a limited knowledge of career options available. Because of geographic isolation and limited knowledge of the world, disadvantaged students simply may not be aware of the variety of career options open to them. Also, these students often lack job skills and frequently leave school without adequate entry-level skills to secure a job in any occupation.

The combined problems of geographic isolation, language deficiency, low academic skills, and limited career aspirations may initially sound discouraging to educators. Experience has proved, however, that when provided the opportunities for applying academic skills, developing a broader range of experiences, improving language abilities, and developing career related skills, these students have great potential for success in school. The challenge to educators is in identifying individual problems and applying appropriate solutions. It is a challenge uniquely suited to the special contributions of industrial arts.

REVIEW OF THE LITERATURE

The problem of the disadvantaged was recognized in the 1950s. Attempts to rectify the problem came in the 1960s. The solutions were generally found wanting by the analysts of the 1970s. Fortunately, however, some of these programs were found to be successful, resulting in positive suggestions for educators of the 1980s. Most of these suggestions have direct implications for industrial arts.

A 1955 address to the American Psychological Association, entitled "Cultural Deprivation and Child Development," has been recognized as the beginning of what has become a national awareness of the problems of the disadvantaged (Friedman, 1970). The existence of a disadvantaged population in the United States was seen as a threat to national well-being, both social and economic. Attempts to rectify the problem began on a national level in the 1960s with federal legislation known collectively as the War on Poverty. For the most part, this legislation, such as the 1965 Elementary and Secondary Education Act (ESEA), assumed that education could be used to remedy the poverty that most disadvantaged groups held in common.

In retrospect, however, the general consensus of analysts is that the schools have failed for the most part in their attempt to make up for the deleterious effects of being poor. The original hopes for such programs as Head Start, Upward Bound, ESEA, and school busing have not been realized (Biehler, 1978, Gordon & Jablonsky, 1970).

Havighurst and Levine (1979) cited a series of factors that contributed to the school's failure in meeting the needs of its disadvantaged learners. Several of the factors were administrative in nature: inappropriate curriculum and instruction, difficult teaching conditions and inadequate preparation of teachers, homogeneous grouping and differential treatment of low-status students, and ineffective delivery of services. Two factors were teacher controlled: teacher perceptions of pupil inadequacy and low standards of performance. Two factors were related to the students themselves and their support groups: lack of previous success in school and lack of parental and peer reinforcement of school norms and learning experiences. Fortunately, experience in the past two decades has produced solutions for many of the problems facing disadvantaged learners. In most cases, industrial arts can be part of the solution.

Researchers and writers in the field have made suggestions on resolving the educational issues of disadvantaged learners discussed earlier in this chapter. Their suggestions are to provide the following kinds of learning:

1. learning that develops academic skills.
2. activities that result in success and increased self-concept.
3. learning that helps students overcome cultural differences.
4. learning that develops communication skills and improves English-speaking ability.
5. learning that is related to the life experiences of students.
6. learning that provides career orientation and exploration.

Each of these suggestions merits further discussion.

Learning That Develops Academic Skills

The fact that disadvantaged learners often have below-average academic skills is the major reason this group is of particular concern to educators. Of course, it is all well and good to point out that disadvantaged learners need to improve their academic skills. The question is, How can the schools in general and industrial arts in particular help bring about this improvement? The literature provides some specific answers. Passow and Elliott (1970) suggested that academic activities for the disadvantaged could take one of two forms, compensatory or developmental. Compensatory learning is designed to make up for past deficits in experience and knowledge, whereas developmental activities incorporate the basic skills areas needed by everyone for a general education. Passow and Elliott stated their belief that both types were appropriate for disadvantaged learners. They felt that the curriculum should include the essential elements of a general education and remediation in the basic areas as required.

Biehler (1978) offered an additional technique for developing academic skills. He suggested teaching specific study and test-taking skills to disadvantaged learners. These skills can be integrated into any subject matter curriculum, and the results would have the potential of improving academic skills across the board.

The classic "learning by doing" was promoted by Heggen (1970) as a technique for improving academic skills. He suggested that by developing manipulative skills, through activities such as industrial arts, students would gain confidence in their abilities. As a consequence, conceptual and abstract learning would become easier.

A skill that proves useful in any academic area is learning to make decisions. The challenge of realistic problems seems to be an effective way of developing decision-making skills in disadvantaged learners. Bergeson and Miller (1971) described techniques used by teachers experienced in working with the disadvantaged. These teachers motivated the students by giving them problems that seemed worthwhile because they were related to practical everyday needs. The teachers then went one step further by helping students plan resolutions to these relevant problems. The teachers not only posed the problems in a realistic way, but they helped students develop skills to solve those problems.

Another often-cited suggestion for improving the academic skills of disadvantaged students is to make the learning activities both concrete and active (Fowler, 1971; Heggen, 1970). Vitrogan (1971) described a creative application of this principle using team teaching between science teachers and industrial/vocational teachers. The science teacher explained the scientific concepts encountered in the technical laboratory, such as the chemistry of combustion. The technical teacher coordinated the student's do-it-yourself building of scientific equipment, for example telescopes, aquariums, or greenhouses. The importance of providing concrete experiences is also evidenced in teaching mathematics. Mathematics teachers who had experiences in teaching disadvantaged learners noted that these students needed applied mathematics experiences in order to understand number theories and operations (Bergeson & Miller, 1971, p. 307).

Besides being applied in nature, learning experiences for the disadvantaged should be active rather than passive. As Bergeson and Miller observed, "Making a map of the Yorktown Campaign will be more meaningful than reading or hearing about it" (p. 6).

Activities That Result in Success and Increased Self-Concept

The consistent lack of success in school by disadvantaged learners eventually erodes their self-concept. Yet, when educators are able to plan successful experiences for these students, it often improves how students feel about themselves. Success-oriented experiences result not only in a positive self-concept but also a feeling of control as a learner, surely an atypical feeling for most disadvantaged students (Havighurst & Levine, 1979).

Industrial arts activities can be effective in providing the successful experiences students need. With proper planning on the teacher's part, industrial arts experiences can be structured to ensure that students achieve at least some success while working toward their completion (Heggen, 1970). The feelings of success gained in the industrial arts laboratory often develop a more positive attitude toward school in general, improving performance in academic subjects as well.

Learning That Helps Student Overcome Cultural Differences

As pointed out earlier in this chapter, one issue facing most disadvantaged students is that they have grown up in a culture or subculture that differs in traditions and values from the mainstream American society. Educators can help students by learning more about the group values and aims of the disadvantaged students they are trying to teach (Fowler, 1971). The learning must go two ways for this suggestion to be successful. While disadvantaged students are attempting to orient themselves to the broader culture, teachers (and peers) need to learn about the subculture(s) represented in the classroom. This approach has the bonus effect of broadening the outlook of everyone involved.

The result should be what Lemlech (1977) refers to as enculturation, as compared to acculturation. "Whereas acculturation is the process of adapting and conforming to the majority concept of culture, enculturation is the process of developing self-identity" (p. 12).

Learning That Improves Communication Skills and English-Speaking Ability

The dual problem of language inadequacy for the disadvantaged is a lack of basic skills in communication (e.g., listening and speaking) often compounded by at least a measure of bilingualism (Passow, 1970). As Bergeson and Miller (1971) pointed out, these learners are not nonverbal. "[They have] the gift of language but it is not middle-class English" (p. 8). The fact remains, however, that it is middle-class English that is the language of the schools.

Lemlech (1977) proposed several ways of developing basic skills. She suggested that teachers provide students with tools of instruction that promoted speaking and listening (e.g., tape recorders and microphones). She also suggested that teachers create experiences to provoke student interest in speaking and listening to others. For example, make something, then talk about it. Or, initiate conflict problem solving in small groups of students. Lemlech also suggested activities involving choosing, then defending the choice. Strategies involving role playing or creative drama could be used to the same end.

Learning Related to Life Experiences

The point has already been made that the experiences of many disadvantaged students are limited to the geographic location and the specific subculture in which they live. For learning to have meaning, the activities should involve people, places, things, and values with which the students are familiar. As Bergeson and Miller (1971) pointed out, even the best activities "may be meaningless for disadvantaged children unless they are related somehow to their experiences and their culture" (p. 6). Similar sentiments were echoed by Gallington (1970), writing on "The Disadvantaged Youth" in the 19th Yearbook of the American Council on Industrial Arts Teacher Education: "Industrial arts as well as all other common learnings should be geared to present-day life experiences. These life experiences should include those of the students themselves as well as their out-of-school peers, idols, and elders" (p. 14).

Learning That Provides Career Exploration and Orientation

One issue discussed earlier was that disadvantaged youths often have low aspirations for future careers. Lack of career-related experiences has been cited as a primary reason for such low expectations.

A report of the Committee for Economic Development (1971) stressed the importance of functional education in providing these experiences:

> During the early years when his vocational interests should be kindled and his aspirations fired, the child all too often is not confronted by the live options that should eventually be open to him. Genuinely functional education uses work and other life experiences as laboratories in which young people find real problems and tasks that require learning. (p. 17)

Heggen (1970) suggested that industrial arts activities, especially group projects involving "designing, manufacturing, distributing, selling and servicing products" (p. 90), are appropriate for disadvantaged learners. Such group projects would introduce students to the world of work and would also promote positive working relationships among students (simulating on-the-job relationships) and develop appropriate manipulative skills.

CONTRIBUTIONS OF INDUSTRIAL ARTS EDUCATION

The unique subject matter content of industrial arts and its applied laboratory orientation provide a program that is particularly beneficial to disadvantaged learners. An effective way to examine the contributions of industrial arts is to look at the goals of the field synthesized from the writings of various authors (Maley, 1973; Wilber & Pendered, 1973). The general goals of industrial arts education are to:

1. provide for the study of industry and technology.
2. develop manipulative skills.
3. provide a platform for the application of academic subjects.
4. develop positive social skills and interpersonal relationships.
5. develop avocational and recreational interests.
6. provide career awareness and exploration activities.
7. increase consumer awareness and skills.
8. develop critical thinking and problem-solving skills.
9. develop an appreciation for good craftsmanship and design.
10. develop safe working practices.

This chapter has established six issues that are prominent when developing programs and activities for the disadvantaged learners. This last, and perhaps most important, component describes the contributions of industrial arts to each of these issues as derived from the review of literature, the goals of industrial arts, and successful experiences from teaching disadvantaged learners.

Improving Low Academic Achievement

The academic handicaps of the disadvantaged child are numerous and well documented. Low skill levels in reading and writing, mathematics, science, and social studies are but a few of the academic problems encountered. The most significant contribution industrial arts can make in confronting this issue is in providing the means for students to relate academic subjects in realistic, *applied* learning situations.

For example, the abilities to read and write are basic to success in any academic area. Students who have not yet developed these skills by the time they reach the secondary level are not motivated to continue trying. In the industrial arts laboratory, however, these same students find that reading textbooks, reference materials, and related technical information is necessary to develop the project they are motivated to construct. For instance, student research on past and present technological achievements related to construction of a project helps to make history and social studies lessons come alive. Developing reports that summarize the manufacture of mass produced products gives new meaning to developing writing and speaking skills.

Similarly, industrial arts provides the key for students who are not otherwise motivated to understand mathematics as they make the necessary measurements and calculations for constructing a product. In a related example, students become involved with science as they apply the principles of heat conduction and transfer in the construction of a solar energy panel.

Industrial arts activities can also be an effective forum for practicing the decision-making and problem-solving skills that are essential for academic success. For instance, the role playing involved in mass production activities provides the ideal opportunity for enhancing decision-making abilities. Selecting the product and materials, choosing team members for specific management and production roles, and selecting marketing techniques all involve the decision-making process. As problems arise, problem-solving techniques can be learned and applied.

One effective means of providing academic skills through industrial arts is to use a team-teaching approach. Exciting learning activities can be cooperatively planned between teachers of academic subjects and the industrial arts teachers. Information learned in the classroom is then applied in the industrial arts laboratory, providing an excellent means of reinforcing both content areas.

The application of academic skills to industrial arts activities can begin at any level, from the most basic skills to enriched learning activities. For the disadvantaged, academics often begin with activities at the compensatory level and work up to more developmental learning experiences.

Obviously, industrial arts classes have much to offer in promoting academic skills for disadvantaged learners. In the broadest sense, the contribution can be defined as application—of basic communication skills, of mathematics and science concepts, of social studies lessons, and of problem-solving and decision-making skills. Academics and industrial arts form a natural symbiotic relationship, working together to the benefit of both and more importantly to the benefit of the learner.

Improving Low Self-Concept

Industrial arts activities provide one element that is crucial in development of a positive self-image: success. Activities in the industrial arts laboratory can be planned to ensure that each disadvantaged child achieves important and immediate success. Once this chain of events is placed in motion, increasingly higher levels of experience can be achieved. As an example, teachers may start by arranging for students to make quickly produced items that may be produced in the laboratory in one day. This method of providing immediate reinforcement helps develop feelings of self-confidence and achievement. As students develop confidence in their abilities, they advance to more complex activities stressing both group and individual projects.

Promoting positive social skills and interpersonal relationships is another way industrial arts can assist the disadvantaged learner. Mass production, industry simulation, and other group activities allow students to interact freely and promote new friendships. The subsequent support of friends in school improves a student's self-concept by providing peer support for school-related activities.

Overcoming Cultural Differences

The role confusion resulting from being "bicultural" can be minimized by activities that help students not only feel positive about their own subculture but also to feel part of the dominant culture. Industrial arts can serve as a catalyst in this process in several ways.

First, industrial arts methods are flexible, allowing students to pursue individual interests related to their subculture. Technological achievements associated with a student's ethnic or racial background are a good focal point. For example, students can construct a culturally oriented project and share the final results with other class members.

Second, group activities can bring students from different subcultures together. Group projects and mass production activities assist in creating friendships and relationships that transcend cultures.

A third significant way industrial arts can assist in overcoming cultural differences is by providing opportunities for students to observe peers and adults with whom they can identify. One way this can be done is to provide peer teaching, where respected students work with others from the same cultural background. Another approach is to use community-based observation techniques where students "shadow" someone from their subculture who is successfully employed in a technological or industrial position. A variation on this theme is to have persons from the community come to the industrial arts laboratory as resources.

Developing Language Skills

Experiences in the industrial arts laboratory can be used to promote language development in both categories, non-English speaking and limited communication skills.

For students to whom English is a second language, industrial arts classes may provide the first successful school experiences. Many industrial arts activities can initially be conducted in the laboratory with limited language proficiency, making it an ideal program for beginning the process of overcoming language barriers. Even if the students speak no English, students can function with success by observing and imitating others. Teachers can combine sign language and interpreters with more conventional teaching methods to communicate with students as they begin to learn the language. Teachers who are not bilingual can endeavor to learn key technical and related terms in the student's native tongue. There seems to be an automatic motivation to learn the language when the names of tools, machines, and equipment are used each day in a realistic, meaningful way. The power of association contributes greatly to building new vocabulary.

The general communication skills of speaking, listening, reading, and writing can all be enhanced through the industrial arts curriculum. The contributions to reading and writing have been discussed previously in relation to academic subjects, but the role of industrial arts in enhancing speaking and listening skills deserves further elaboration. For example, classroom seminars and group problem-solving sessions are excellent ways of improving verbal communication skills. Additional industrial arts opportunities for improvement of speaking abilities may include out-of-class activities such as interviewing, simulating job interviews, and conducting industrial and market surveys.

Most activities that allow students to practice speaking provide other students with the opportunity to practice listening. However, students need more than just practice to improve their listening skills. Instructors can begin by *teaching* students techniques for improving audio receptive skills. It is then possible to apply techniques such as lecture/demonstration, film loops, and slide/tape presentations that stress the use of more than one modality. Listening skills are reinforced as students are able to simultaneously hear and see how to safely operate a table saw or set up a machine lathe for threading. Self-instructional audiovisual materials provide the opportunity to listen as often as necessary to learn.

Expanding Life Experiences

Poverty, substandard housing, inadequate transportation, reduced travel opportunities, and inadequate schools all contribute to the disadvantaged child's lack of the same experiences that are taken for granted by many other children. Industrial arts offers a range of activities and experiences that assist in compensating for this concern. The types of activities include (a) a broad scope approach to the study of industry and technology, (b) development of psychomotor/manipulative skills, (c) development of recreational and avocational skills, (d) consumer knowledge experiences, and (e) safety awareness programs.

Scope of Industrial Arts. The definition and intent of industrial arts does not stop at simply "making things." By definition, it is a broad discipline. It encompasses the study of technology, its significance, evolution and use, and the study of industry, its organization, materials, occupations, processes, and products. It also includes the study of the problems and benefits caused by industry and technology (Maley, 1973). Industrial arts content and subsequent learning activities hold great potential for providing the disadvantaged learners with a better understanding of our technological-industrialized world.

The key to providing a broad range of experiences for the disadvantaged lies with the many innovative methods or plans developed specifically for teaching industrial arts. The importance of these plans is that most stress a range of experiences and activities. Some stress prevocational career preparation, while others focus on contemporary industrial production methods. One example, the Maryland Plan, is a comprehensive, student-centered plan stressing the development of the needs of each student through a broad exploratory approach. Activities range from the historical study of technology to the problems and benefits of our industrialized world (Maley, 1973). The disadvantaged learner benefits greatly from an industrial arts program which provides such diverse experiences.

Manipulative Skills. Middle-class children are frequently introduced to a range of manipulative skills early in their development through creative toys, games, and playthings. It is not unknown for more fortunate children to also have access to home workshops where they are encouraged to develop skills with tools and machines. Disadvantaged children rarely have the same opportunities. The first real opportunity for them to explore, create, and construct with tools and materials may come when they enroll in an industrial arts program. Gross and fine manipulatory skill acquisition suddenly becomes a major contribution in the previously limited development of these students. Drawing, designing, cutting, gluing, finishing, welding, and machining are but a few of the activities which contribute to the previously limited range of psychomotor experiences available to the disadvantaged learner.

Recreational/Avocational Skills. Often, leisure-time activities and avocational interests are undeveloped in the disadvantaged learner. Industrial arts contributes to this development in two ways: by developing an awareness of a variety of potential interests and by acquiring necessary manipulative and cognitive skills. Because of the variety of activities conducted in the industrial arts program, it is possible to apply these skills to such diverse avocational interests as furniture refinishing, house construction, model making, photography, archery, lapidary, car racing, and restoration activities.

Consumer Knowledge. Disadvantaged learners may not have the opportunity to acquire or apply consumer knowledge simply because they seldom have significant purchasing power. It is particularly important that they be made aware of a variety of industrial and home products and how to apply consumer information when they do make purchases. The industrial arts laboratories and classrooms are typically filled with tools and equipment that may eventually be purchased by students. Teaching these students to become knowledgeable consumers of such products is an important contribution industrial arts can make to their education.

Safety. Until the disadvantaged learner enrolls in an industrial arts class, the definition of safety may simply mean personal protection. In the industrial arts laboratory, perhaps for the first time, the learner has the opportunity to understand the concept of safety from two perspectives: personal safety and the safety of others. Industrial arts contributes in a very meaningful way to developing a sensitivity to and an awareness of safety practices. The disadvantaged student is able to learn the safe and correct way of using a variety of tools, machines, equipment, and instruments. The learning of good safety practices applied in the industrial arts laboratory can subsequently be put to practice in real-life situations.

Increasing Career Aspirations

A final issue confronting disadvantaged students in which industrial arts can make significant contributions is in overcoming low career aspirations. Industrial arts can provide career-related activities and information to help students become aware of all levels of occupations and become prepared to make knowledgeable career choices.

There are several ways that industrial arts contributes to the overall career aspirations of the disadvantaged learner. First, there is a close relationship between career education activities and industrial arts. Many career-related activities are made available to the disadvantaged enrolled in industrial arts courses. Awareness, orientation, exploration, and involvement with career-related experiences provide a continuum of information and understanding about the specific aspects of careers. One example of career-related experiences is the opportunity for students from disadvantaged backgrounds to work cooperatively in group activities such as mass production. This experience develops positive social skills and interpersonal relationships while providing a realistic simulation of industrial production techniques.

A second way industrial arts can contribute to providing positive career aspirations to the disadvantaged is through the development of technical skills. Construction, manufacturing, communication, and transportation class activities provide for acquisition of a variety of technical skills that may later be applied to occupational preparation.

A third career-related contribution is the introduction of the disadvantaged learners to the concept of the American work ethic. Although not now a universally accepted concept, the work ethic is the basic precept upon which our nation has built a high standard of living. Simulated work experiences in industrial arts can provide the disadvantaged learner with reinforcement for the moral and ethical concepts important in getting and keeping a job.

A final career-oriented contribution of industrial arts is the opportunity for the disadvantaged learner to apply the separate aspects of career information and skills learned in industrial arts to a limited work experience. For example, this experience may be a part-time job after school, or a full-time position, such as summer employment. There is no better way for the disadvantaged student to practice occupational-related skills learned in the industrial arts laboratory than to apply them in the marketplace.

SUMMARY

Despite social programs, poverty and isolation still exist in the U.S. Disadvantaged students who grow up under these conditions will be part of public education in the foreseeable future. Providing appropriate programs for these learners will continue to be a challenge to educators.

The challenge will be met only as educators build on ideas that have been proven to be successful—motivating students with action-oriented activities, integrating academics with applied learning experiences, and helping students learn about the world in which they live. Although the precise direction of future programs for the disadvantaged cannot be predicted, one is certain: Industrial arts can have a major role to play.

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Chapter 5

Industrial Arts and Its Contribution to The Education of the Handicapped

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THE ISSUE

The central focus of this discussion is that industrial arts has a major contribution to make in the education of the handicapped. As a part of the general education of all people, it is also pertinent to the needs of the handicapped. Because of the nature of the content, activities, and learning process in the industrial arts experience, however, this program area has special significance for the handicapped.

CHARACTERISTICS OF THE ISSUE

A conservative prediction is that nearly four out of five of the 2.5 million or more handicapped youths who leave our high schools during the next four years will exist at the poverty level, be underemployed, or be unemployed (Smeltzer, 1977). Occupational training and education for these handicapped individuals has historically been the responsibility of the special-class teacher. Unfortunately, special educators have often been unprepared to teach job-related curricula and have concentrated on teaching traditional academic subjects. Industrial experiences for the more severely handicapped have been restricted to sheltered workshops, where the range of occupational choice in training and job experience is usually limited (Olympus Research Corporation, 1975).

It has become increasingly difficult to define specifically what is meant by the classification, handicapped individuals. Thus, advocacy and service groups; local, state, and federal agencies; and professional and lay organizations have offered a variety of definitions. Regardless of the complexity involved in accurately defining each handicapped group of individuals, it is clear that the handicapped population in the United States is much larger than is generally realized.

The definition of *handicapped persons* used throughout this discussion reflects the definition of terms used in the Rules and Regulations of the Education for All Handicapped Children Act (PL 94-142). PL 94-142 refers to children who are mentally retarded, hard of hearing, deaf, speech impaired, visually handicapped, seriously emotionally disturbed, orthopedically impaired, otherwise health impaired, deaf-blind, multiply handicapped, or who have specific learning disabilities.

All of these individuals require special education and related services to function at maximum levels. Many special educators, however, do not recognize the contribution industrial arts can make to the handicapped learner. As a result, few students classified as handicapped receive industrial arts training even though the industrial arts curriculum can provide the skills and knowledge necessary for effective living and to obtain future job and career goals.

Until the passage of PL 94-142 and its accompanying mandate that handicapped individuals must be offered all educational rights and privileges afforded the nonhandicapped individual, few vocational or industrial programs were provided for this population. Programs that did address the needs of the handicapped were predominantly rehabilitative and tended to accept only high-functioning individuals with potential for later employment (Bender, 1978).

Also, society in general has viewed handicapped persons as having an overabundance of physical anomalies as well as intellectual limitations. Handicapped individuals are more similar than dissimilar from other individuals and can benefit from a total school program that includes industrial arts.

The educator who works with handicapped students must know the definition and characteristics of handicapping conditions. It will become increasingly clear from the following discussion that all handicapped individuals can benefit from industrial arts experiences.

REVIEW OF THE LITERATURE

Although there are numerous definitions of the term *mental retardation*, the most widely accepted is that of the American Association of Mental Deficiency: Mental retardation is "significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behavior, and manifested during the developmental period" (Grossman, 1973). Mental retardation can be broken into four major catagorical levels: mildly retarded or educable (IQ 69-55), moderately retarded or trainable (IQ 54-40), severely retarded (IQ 39-25), and profoundly retarded (IQ 24 and below).

Yet, intelligence scores associated with specific levels of mental retardation cannot and should not be used as the sole criterion to determine if an individual is mentally retarded. Categories used to describe a mentally retarded individual are not always clearly separable and should be carefully analyzed before being used to develop educational programs and activities. Only in recent years have educators and those who work intensively with the mentally retarded become vocal in explaining the difficulty in placing a retarded individual into a distinct category. Too often, children who have been classified as moderately retarded at an early age have exceeded the expectations suggested by this classification. One of the most recent groups of mentally retarded individuals to do this is the severely and profoundly retarded. As a result of intensive programming, many severely and profoundly retarded individuals have exhibited levels of achievement that would not have been considered possible only a few years ago. It is, therefore, important that persons working with any level or degree of retardation do so cautiously and with as much supporting information as possible.

It has become increasingly difficult to explain mental retardation in terms of an etiological basis as technology continues to advance, providing new clues to the reasons for mental retardation. Other etiological classifications—including those involving infections and intoxicants, metabolic or nutrition disorders, trauma, or chromosomal abnormalities—have added to the perplexity of accurately defining mental retardation.

A most significant fact is that most causes of mental retardation are still unknown. Mildly retarded individuals tend to fall into this unknown category and are often described as individuals with cultural or familial retardation.

Specific Learning Disabilities

PL 94-142 defines specific learning disability as:

> a disorder in one or more of the basic psychological processes involved in understanding and using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations. The term includes such conditions as perceptual handicaps, brain injury, minimal brain dysfunction, dyslexia, and developmental aphasia. The term does not include children who have learning problems which are primarily the result of visual, hearing, or motor handicaps, or mental retardation, or of environmental, cultural, or economic disadvantages. (Education of Handicapped Children, p. 42479)

Admittedly, the definition of *learning disabilities* includes numerous philosophies, many of which have contributed to confusing the parent as well as the professionals who work with these children. Adding to the difficulty is the myriad of medical, educational, and psychological terms used to define such children. These terms are listed in Figure 5-1.

Terms Associated With Learning Disabilities

- Behavioral disordered
- Behavioral problem
- Brain damaged
- Brain injured
- Delayed language
- Developmental aphasia
- Disruptive/aggressive
- Dyslexia
- Educationally disabled
- Educationally handicapped
- Emotional blockage
- Hyperactive
- Hyperkinetic
- Language and learning disabled
- Language disabled
- Learning disability
- Minimally brain dysfunctioned
- Minimally medological dysfunctioned
- Neurologically impaired
- Perceptually handicapped
- Predelinquent
- Socially maladjusted
- Subtle neurological impairment
- Strauss Syndrome

Figure 5-1.

These children have traditionally been placed in industrial arts classes as a result of deficits in academic areas. Ironically, the memory, sequential, integration, and perceptual problems that resulted in academic failure often did not occur in the industrial arts setting.

Speech Impairment

Speech impairment is defined as

> a communication disorder, such as stuttering, impaired articulation, a language impairment, or a voice impairment, which adversely affects a child's educational, performance. (Education of Handicapped Children, p. 42479)

The ability to speak and to understand the spoken word is obviously critical. A deficit in this ability will probably interfere with the development of interpersonal relations. Any speech that creates unfavorable attention, be it in the form of unpleasant sounds or of inappropriateness to the age level, may be classified as defective.

Speech is the assimilation of sounds into words, then the combination of these words into units that convey meaningful utterances (Kirk, 1972). Essentially, speech involves a great deal more than the ability of the student to articulate sounds. Speech is a vocal representation of symbols of a formalized language that is used to convey and exchange ideas.

Deafness and Loss of Hearing

The definition of the term *deaf*, as it is contained in PL 94-142, means a hearing impairment "which is so severe that the child is impaired in processing linguistic information through hearing, with or without amplification, which adversely affects educational performance." PL 94-142 defines *hard of hearing* (loss of hearing) as a "hearing impairment, whether permanent or fluctuating, which adversely affects the child's educational performance but which is not included under the previous definition of deaf." In discussing individuals who have hearing impairments, terms such as *auditorially impaired* or *acoustically impaired* are often used synonymously. *Hearing impaired* is an extremely broad term and can include both *deaf* and *hard of hearing*. Students who are defined broadly as hearing impaired require special education; but unless the exact parameters of the hearing deficit are explained, it is impossible to state what frequency or level of special education services might be required. One widely accepted definition of *hearing impairment* is a hearing disability that may range in severity from mild to profound (Reynolds & Birch, 1977).

The term *deaf* usually denotes the absence of hearing in both ears and has been specifically defined by the American Association for the Deaf as a person whose hearing disability precludes successful processing of linguistic information through audition, with or without a hearing aid. *Audiometric deafness* is another term often used to describe children who are deaf, and implies that the amount of hearing loss a person has extends beyond a certain point, as measured by audiometric testing. This approach to defining deafness allows it to be discussed in quantifiable terms.

Hard of hearing (loss of hearing) usually implies that the student has had sufficient hearing during infancy to acquire the foundations of language without special teaching. These students, however, will in all probability still require special education because of their imperfections in the language development process and because they experience difficulty in learning basic communication skills (e.g., reading, writing, and skills associated with speech). The American Association for the Deaf defines the hard of hearing person as one who (generally with the use of a hearing aid) has residual hearing sufficient to enable successful processing of linguistic information through audition.

Serious Emotional Disturbance

The handicapping condition of serious emotional disturbance can include one or more of the following characteristics over a long period that adversely affects educational performance:

1. an inability to learn that cannot be explained by intellectual, sensory, or health factors.
2. an inability to build or maintain satisfactory interpersonal relationships with peers and teachers.
3. inappropriate types of behavior or feelings under average circumstances.
4. a general mood of unhappiness or depression.
5. a tendency to develop symptoms or fears associated with personal or school problems.

The definition would also include children who are schizophrenic or autistic but would not include those children who are socially maladjusted, unless it is determined that they are seriously emotionally disturbed. The definitions provided in PL 94-142 offer numerous challenges to those charged with educating children who are seriously emotionally disturbed. Students who have serious emotional problems are particularly visible in the school. Many of them have difficulty controlling or delaying their emotional responses, including their frustrations, and ultimately are participants in peer or authority confrontations.

For many of these students, industrial arts activities is one of the few areas in which they can experience success.

Orthopedic Impairment

The term *orthopedically impaired* suggests a severe orthopedic impairment that

> adversely affects a child's educational performance. The term includes impairments caused by congenital anomalies (club foot, absence of some member) impairments caused by disease (poliomyelitis, bone tuberculosis) and impairments from other causes, such as cerebral palsy, amputations, and fractures or burns which cause contractures. (Education of Handicapped Children, p. 42478)

The term *crippled* is outdated and has often been interchangeable with *orthopedically handicapped.*

Historically, many children with orthopedic impairments were excluded from school programs on the basis that the building was not constructed to accommodate them. The passage of the Vocational Rehabilitation Act and PL 94-142 has ensured these students accessibility to programs and has done much to remove the physical barriers they often confront.

Although orthopedically handicapped students are disabled in motor abilities (Kirk, 1972), these students often show deficiencies in social and interpersonal relationships. In many instances, there is no effect on educational achievement; and most learn to write, read, and learn other academic subjects in the same way as their nonhandicapped peers.

Other Health Impairments

Students with special health problems have been defined as *other health impaired* by the regulations of PL 94-142. These are students with limited strength, vitality, or alertness as a result of chronic or acute health problems that adversely affect the child's educational performance (e.g., a heart condition, tuberculosis, rheumatic fever, nephritis, asthma, sickle cell anemia, hemophilia, epilepsy, lead poisoning, leukemia, or diabetes).

The majority of students who come under the category of other health impaired are often educated in classrooms for the physically handicapped. These would include children with arthritis and those students with the following medical conditions:

> **Asthma**—A repeated occurrence of wheezing, coughs, difficult breathing, and feelings of constriction because of bronchia conditions.
>
> **Congenital Anomaly**—Any body, organ, or part existing in an abnormal form from the time of birth.

Diabetes—A disorder of metabolism of carbohydrates that is indicated by an excessive amount of glucose in the blood and urine.

Epilepsy—A disorder of the brain sometimes resulting in convulsive movements and periods of unconsciousness.

Hemophilia—A condition in which the normal blood clotting procedure is defective.

Leukemia—A form of cancer affecting the balance of cells in the blood, and therefore the normal functioning of the blood.

Poliomyelitis—A viral infection resulting in the paralysis of body parts or systems, depending on which part of the central nervous system has been attacked.

Rheumatic fever—A disease characterized by fever, inflammation, and pain around the joints and inflammation of the muscles and valves of the heart.

Spina bifida—An anomaly characterized by weakness in the bone that encases the spinal cord.

Visual Handicaps

The Social Security Act of 1935 established the definition that blindness "is visual acuity for distant vision of 20/200 or less in the better eye, with best correction; or visual acuity of more than 20/200 if the widest diameter of field or vision subtends an angle no greater than 20 degrees" (National Society for the Prevention of Blindness, 1966). Reynolds and Birch (1977) emphasize that the above definition is strictly a legal one that identifies categories or classes of persons for certain legal purposes. But, when one is discussing educational planning, the classification is totally different. Those working with the blind and visually impaired will note that it includes not only people who are totally blind (i.e., those who are unable to distinguish light from dark or have no perception) but also those who have some vision and are characterized as being severely visually impaired in one or both eyes. It is important to emphasize that the *legal* term *blindness* is not synonymous with *total* blindness.

The term *partially sighted* is often used in describing students whose vision is somewhere between 20/70 and 20/200. A student with 20/70 vision can read at 20 feet printed letters that are 1-¼ inches high. The person with 20/200 vision can read letters 2-½ inches high at the same distance. Anyone with 20/400 vision or worse cannot read letters of any size at 20 feet, yet such a person may be able to function as a sighted person educationally by reading pages of normal type at the usual distance, or closer, with the aid of special lenses.

The term *visually handicapped* implies that students who take part in school activities have no vision, or their visual acuity is so limited even after optical correction that a special teaching methodology and materials would be necessary to achieve stated objectives and goals.

Programs for the Handicapped

A wide discrepancy continues to exist in what the handicapped are actually doing educationally and what they are capable of doing, both qualitatively and quantitatively. Bender (1978) conducted studies in using the methodology of imitation to teach industrial arts to moderately and severely retarded individuals. One of his major conclusions was that severely handicapped individuals can learn many industrial arts tasks through the process of imitation. In addition, his findings supported the view that severely handicapped individuals do learn by doing and performing. Obviously, these types of tasks are prevalent in the industrial arts laboratory.

Gold (1973) and others have demonstrated that tests of intelligence, manual dexterity, and work-sample tasks are of limited usefulness in predicting eventual work performance.

Xanthakis and Sugimoto (1975) assessed how moderately handicapped persons functioned in the working environment if the tasks that they were required to perform were kept simple and singular in action. Their findings supported the view that mentally retarded individuals are often able to function at the same or a higher level than their nonhandicapped peer in many of the assembly line tasks.

Lutz (1978) has indicated that teachers often don't allow enough time to search for the abilities of students and tend to overlook much of their potential. He advocates working with the students' abilities or strengths despite their learning disabilities. He also advocates a range of career exploration through industrial arts programs that can prepare special-needs learners to make decisions about occupational courses.

Goldman (1975) grouped individuals, including parents, special education teachers, supervisory personnel in sheltered workshops, and supervisory personnel in competitive industries, and asked them to rank what they believed were the basic requirements for successful employment of the handicapped. The criteria they were asked to rate were divided into four categories: (a) personal-care areas, (b) interpersonal skills, (c) job tasks, and (d) academic areas. The results indicated that personal care was considered extremely important by workshop supervisors, while teachers overwhelmingly valued teaching interpersonal skills for success in future industry. Workshop supervisors ranked job-task items more essential than did parents or teachers. Parents ranked academic items as most essential; all other groups, including workshop supervisors, ranked academic items as least essential. Thus, industrial arts teachers must clarify the perceptions parents have or what leads to successful employment.

There is still a limited relationship between classroom activities and work activities. Work experience objectives, when part of a program for special-needs students, are often determined by individual preferences of the teacher or job supervisor. In addition, criteria for work success are either poorly or inadequately defined. As usual, the teacher is the key to whether a program may or may not be successful.

Historically, work-related activities for the severely handicapped are referred to as sheltered workshops. Nelson (1971) and Wolfensberger (1967) have documented characteristics of sheltered workshops for the handicapped. These are (a) the transitional shop, in which students from school programs, institutions, or homes prepare for placement in competitive employment; (b) the extended care or terminal shop in which students may have difficulty in achieving competitive employment for periods of time; and (c) the comprehensive sheltered workshop, which attempts to serve both groups of individuals. Comprehensive shops also provide services for persons with a variety of handicaps and are most prevalent today.

An often-stated difficulty with sheltered workshops is their inability to attract contracts from outside industry. When contracts are received, they often do not parallel the training students may have had. This results in a continuous need for retraining.

If handicapped individuals are to use fully their potential, their education must include information, activities, and objectives concerning the world of work. This education must not be relegated to the junior or senior high years of the school program. It must be at an early age and continue to successful employment (Hurley & Kokaska, 1978).

Most handicapped persons in this country are either underemployed, unemployed, or working in jobs that are beneath their capabilities. Conversely, many are placed in jobs that are too difficult for them, causing pressures that lead to their dismissal. In essence, their training has been inappropriate and not thorough. Thus, education for handicapped children must include placement in industrial arts programs.

Many model programs have proved to be beneficial in educating and training the handicapped learner for the world of work. Many of these programs emphasize prerequisite and interpersonal skill training as an attempt to prevent failures in actual job placement. Others offer simulated work experiences in a variety of cluster areas. In each area, the handicapped student is offered the opportunity to learn several tasks. The program's intent is not to teach a specific job skill but rather to introduce each student to work tasks that would be valuable in job situations (Alper, DeNeve, & Retish, 1977). This philosophy of job generalization skills is extremely important because it is reasonable to expect the handicapped individual will not remain in his or her original job and will need to be trained in more than one setting and in a range of work activities.

The majority of model programs emphasized dependability, cooperation, punctuality, and other qualities viewed by employers as important. Handicapped students were given opportunities to work together, not only with their peers but with a variety of people. Emphasis was also placed on how they interacted with the public.

One important aspect of the model programs is that most included a gradual planned transition from a school environment that was preplanned and predeveloped to work with a student's strengths to an integrated work environment in the outside world. The model programs offered a series of job experiences that were closely supervised by job coordinators and teachers.

Many programs contained prevocational assessments before there was any integration of special education students into the regular ongoing industrial arts and vocational education programs.

Other programs included follow-up systems that provided feedback to employers and employees. An outstanding feature of this type of program is that trainers or occupational training specialists offer their own services to learn the specific job the handicapped individual is to learn. They then train the handicapped student before placement in the job.

CONTRIBUTIONS INDUSTRIAL ARTS CAN MAKE TO THE EDUCATION OF THE HANDICAPPED

Handicapped students require a variety of teaching approaches and perform best when their curriculum is functional, relevant, and appropriate to their educational needs. The same could also be said for the nonhandicapped student. Too often, however, the special-needs learner is enrolled in special classes for the entire day, and the opportunity to work with a variety of methods, materials, and equipment is rare. Often cognitive and academic skills are stressed to the point that the result is a unidimensional handicapped student who may possess a wealth of memorized facts but little knowledge in the way society functions, especially in relation to industry and work. Yet, this student is expected to function in some type of employment, whether it be part-time, sheltered, or highly supervised, without learning the skills that may contribute to his or her success. Some work-study programs in special education classes have done much to provide some of these necessary skills; but the majority of handicapped students are not able to participate in these classroom arrangements until late in their educational program or until they are a certain age.

Bender (1979) suggested that handicapped students should be exposed to industry-related situations in the preprimary and primary grades so they can develop work-related repertoires and the prerequisite skills for secondary-level industrial arts classes.

There are many competency areas for the handicapped learner that are fostered and developed in the industrial arts classroom. These areas involve communication skills, fine and gross motor skills, interpersonal skills, and functional academics that are job related.

Communication Skills

Too often, the handicapped learner becomes a passive participant in his or her educational program. Assumptions are made that he understands information without any concrete basis for the testing of this hypothesis. Many handicapped learners have receptive as well as expressive communication difficulties. The students' frustration of not being able to express themselves other than verbally accentuates the handicapping condition.

By engaging in industrial arts activities, students can express themselves in many unique ways. Demonstrating the steps required for the completion of a task provides evidence to the teacher that the student has understood what to do without having to rely on the traditional methods of testing. Approaches such as this may be especially suited for students who are deaf, who have cerebral palsy, or who have other health impairments.

Fine and Gross Motor Skills

It is somewhat ironic that many of the fine and gross motor skills to which a special-needs learner is exposed in a traditional classroom setting have little to do with the world of work. Yet, a major educational goal for this population has traditionally involved getting them ready for work or sheltered work programs.

Industrial arts programming can emphasize the other motor skills a student needs to participate in society or function at a job. Individualized instruction is simplified through the use of concrete objects in functional situations where the student can see why he or she has to learn these skills. The ability to functionally use fine and gross motor skills as part of the teaching and learning process is a valuable asset that few traditional curriculum areas possess.

Interpersonal Skills

Too often, the handicapped learner is trained or educated in a classroom setting that replicates how the teacher perceives society. Techniques such as role playing or imitating the actions of the teacher are used to mirror what can occur on a job. Many students learn these techniques well until their first day in industry, when they realize no training was provided in how to take coffee breaks or how to react to environmental noises and distractions. In addition, the student may fail to be successful, not because he or she lacks the necessary skills, but because the socialization process of how to get along with co-workers was not taught in a realistic environment.

Industrial arts programs can replicate the reality of industry. Line productions and group projects can allow the student to work with others and experience frustrations, problems, and the realities of work. Industrial arts can provide the student with the opportunities to experience how he or she may act in real situations. Few other curriculum areas can provide this exposure and experience.

Functional Academics

For many handicapped learners, academic areas such as reading, writing, and math need to be taught in a functional way. Rote memorization or learning to read information without apparent reasons has done as much to handicap special-needs learners as has poor teaching. The teaching of academics should be viewed as providing needed information for students so they can function better in society.

Although many special education programs have taught academic skills to their students, few have incorporated teaching these skills in real-life situations. Aside from taking the students on buying trips or asking their parents to allow their children to take a more active part when they go shopping, little is done. Such terms as *gross*, *dozen*, and *pound* are usually not covered in class until the students have mastered prerequisite information. Yet this kind of information can be easily incorporated into the industrial arts program when purchasing materials or shop supplies. The concreteness that industrial arts can bring to this specific curriculum area is an advantage few programs can offer.

In summary, many special-needs students may not develop the craftsman-type skills traditionally associated with some industrial arts programs. The objective for many of the special-needs students will not be skill development but will be in learning how to communicate with other students, working with their peers, and experiencing what work might be like for them with its excitement, frustrations, disappointments, and successes. These skills are as important to the handicapped learner as the learning of a vocation, and it can be provided in the industrial arts laboratory.

SUMMARY

It is clear the general population perceives handicapped individuals as being far less capable than they really are. Long-standing expectancies that most recently have been shown to be inappropriate are slow to change.

Even though past and recent legislation, PL 94-142, and the Vocational Rehabilitation Act of 1973, Section 504, guarantee equal access in employment and training, the handicapped individual will still have to fight for the right to participate in vocational and industrial arts programs. Maley (1980) is correct when he states that the degree of an individual's success in an industrial arts program also depends on the teacher and his or her concern to promote excellence with all types of students.

This successful educational development of a handicapped individual is going to require an orientation program at an early age that stresses work and career exploration, and subject matter taught in relation to hands-on experiences.

It is also clear that industrial arts can fulfill the challenge of providing industry-related curricula to the handicapped. By participating in such a work experience, handicapped learners can gain a better understanding of their abilities rather than just their disabilities. It quickly becomes obvious that it is not the construction of projects or the development of skills that is singularly important, but it is the ability to relate what is being taught to the world of work. The development of positive work attitudes and the creation of an atmosphere that allows for an interchange of socialization skills are often significant results of a sound industrial arts program.

It is not just the behavior of children that warrants change. We must also begin to change the behavior of educators who have historically resisted accepting the handicapped. Providing a free and appropriate public education will never come to fruition if the skills, attitudes, and world-of-work concepts taught in the industrial arts laboratory are not assimilated into programs for the handicapped. By ignoring the teaching of these skills, we are preparing the handicapped individual for yesterday's society.

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Chapter 6

Industrial Arts and Its Contribution to Career Education

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THE ISSUE

Industrial arts has a major contribution to make in career education. Three areas of particular importance are technological society awareness, personal self-realization, and essential skills development.

There is little question that industrial arts can provide much support to a good career education program. This discussion will deal with these important contributions. It will also deal with another dimension of the issue that the other subjects in education will probably not have to confront. This is prompted by the fact that administrators, curriculum developers, and teachers have expected industrial arts to contribute *too much* to career education programs. This may seem, at first glance, to be an enviable position for the profession, but it has actually worked to the detriment of both industrial arts and career education.

CHARACTERISTICS OF THE ISSUE

This section contains a brief discussion of the historical development of career education. Many volumes have been written on the subject; but space is limited, so only milestone or important concepts will be discussed. The second part of this section will consider some serious obstacles to the success of career education as implemented through industrial arts programs.

Career Education: Its Origins and Goals

The career education movement is a rather recent development in American education. As an innovation for educational change, it was first conceived in 1971 and rapidly became the center of attention as a new direction for public schooling. This rapid rise in popularity can be attributed, in part, to the fact that it was conceived at the very highest level of our educational system by Sidney P. Marland, Jr., then U.S. Commissioner of Education.

As initially envisioned by Marland, career education was to be a bold effort to improve vocational education. In 1971, he spoke of career education as

> an absorbing topic at the Office of Education lately. In essence the question is: what is right and what is wrong with vocational education in America today, and what can be done to build on our strengths and eliminate our weaknesses? (p. 27)

Marland, in the beginning, purposely did not present a prescriptive definition for career education. The concept almost immediately grew to a form of education that was much broader than originally conceived. By 1972 Hoyt (Hoyt, Evans, Mackin, & Mangum, 1972), a pioneer in career education concepts and literature development, defined it as

> the total effort of public education and the community aimed at helping all individuals to become familiar with the values of a work-oriented society, to integrate these values into their personal value systems, and to implement these values into their lives in such a way that work becomes possible, meaningful, and satisfying to each individual. (p. 1)

The philosophical base of Hoyt's definition has generally been accepted as what career education should be. It is considered a part of all education, from kindergarten through adulthood. It should make all education more meaningful by relating all subjects to the many ways in which adults earn a living. Career education is not intended to be a separate subject; but instead, it should be a new orientation toward real-life situations for existing subjects. Career education should not diminish or "water down" the content in any subject but instead should make it more relevant to the students as they attempt to determine their life work.

Many have also conceived career education to be preparation for something much broader than how a person earns a living. In addition to the work that one does to earn a living, which may change many times in one's lifetime, work may include the "work" that one does as contributions to society, the "work" that one does in raising their children, and the "work or play" that one calls leisure or recreation. This is but a sampling of the important facets of what is needed to help youth prepare for productive, satisfying "careers" or lives.

Common Pitfalls in Career Education Programs

As career education programs have been developed and implemented in the past few years, several misinterpretations have become obvious because of their frequency of occurrence. This section will discuss some of these common pitfalls in implementation.

Career education limited to industrial arts programs. For a variety of reasons, the industrial arts program in many schools has been transformed into the "career education" program. Certified industrial arts teachers have suddenly become the "one and only" career education teacher in a school building. The concept developers never intended for career education to displace any curriculum area or be limited to one area.

There are probably several reasons why "career education" has been substituted for industrial arts in some individual schools. Lack of standards and guidelines in some states may have made it easier to impose a "window dressing" program in industrial arts rather than to redirect or alter the programs of the entire school.

A weak or substandard industrial arts program may have caused an administrator to substitute "career education" with the feeling that one problem was being eliminated with this new concept. The administrator, however, must realize that given the value and necessity of good industrial arts programs for all youth, the priority should be to strengthen the existing program. Implementing a good career education program in the entire school is quite another matter. The latter problem cannot be used to solve the former.

A more in-depth look at the concept of career education will show the inadequacy of expecting industrial arts alone to accomplish the task. The U.S. Office of Education has grouped the many possible careers into 15 clusters, as follows:

Agribusiness
Business and office
Health
Public service
Environment
Communications and media
Hospitality and recreation
Fine arts and humanities
Manufacturing
Marketing and distribution
Marine science
Personal services
Construction
Transportation
Homemaking

(Worthington, 1973, p. 58)

It is evident that industrial arts cannot do the entire job of educating about careers. In fact, the primary role for industrial arts would involve only about four of the career clusters. The clusters listing shows that careers are not limited to industry, technology, and trades.

If all teachers make an effort to relate their discipline or specialty to associated careers, it would do much to help children and youth make informed and intelligent career decisions. A career education program limited only to industrial arts is much too narrowly conceived and will not provide students with the orientation they need.

Industrial arts limited to career education. The same general problem of narrowness will now be approached from a slightly different perspective. That is, industrial arts cannot be restricted only to teaching career education. Just as all other school subjects have important functions, content, and skills to impart to students, so does industrial arts. A career education program cannot simply be substituted for industrial arts without the liberal education of students suffering a serious loss.

For many years, good industrial arts programs have been guided by several important functions. Olson (1963) outlined six typical functions of those that have given direction to the profession. These are the technical, occupational, consumer, recreational, cultural, and social functions (pp. 165–188).

Technical skill development and understanding are the most visible of the several industrial arts functions. There is much concrete evidence in schools throughout the country to illustrate that important skills and understandings are being developed by industrial arts students. A sampling of these includes: engineering drafting, an important communication device of industry; electricity and electronics concepts mastered and applied; and various power concepts learned and used in designing, building, and testing energy generation and transformation systems.

The occupational function is one that the industrial arts profession has recognized since its inception. Unlike several other disciplines, industrial arts has traditionally taken seriously this role of orienting youth to available occupations or careers in industry. Problems have, however, been encountered in two related areas. First, many educators are confused about the liberal education role of industrial arts versus the much narrower trade training role of vocational education. Second, industrial arts concentrates too much on the role of operatives and trades people in industry. In many cases, the roles of management, salespeople, clerks, researchers, technologists, and many other equally important occupations of industry have been neglected.

The consumer function, while often not one upon which curriculum is built, is an extremely valuable byproduct of good industrial arts. In an age in which so much is technical and complex, including our consumer products, being a knowledgeable consumer is an important part of being a liberally educated person. The technical and occupational functions do much to make industrial arts students good consumers.

All persons need wholesome, constructive leisure-time activities. The recreational function, like the consumer function, is not of first concern in curriculum development; however, the experiences gained in industrial arts with tools, machines, and materials give students the necessary background for developing many leisure-time pursuits. Whether or not students select careers in business or industry, many can attribute their constructive hobbies and satisfying leisure activities to industrial arts. Because of industrial arts experiences, many home maintenance chores may be dealt with as enjoyable challenges rather than impossible, expensive headaches!

One universally accepted role of the school is to provide the students with an understanding of the society in which they live. The technological and industrial nature of society has been dominant throughout most of America's history. The cultural function in industrial arts helps students better understand the role that technology plays in society.

Industrial arts offers many opportunities to develop personal and social understandings. Discovering and developing one's interests, strengths, and abilities to work with others are a part of the important social function. Good industrial arts programs provide some of the best opportunities in the school for personal self-realization and social development.

The preceding discussion has reviewed six important functions of industrial arts. Within the context of these functions, industrial arts has much liberal education to offer all students. Although there is much valuable career education in a good industrial arts program, to change an industrial arts program to a career education program would, in the final analysis, narrow it considerably and deprive students of many opportunities. Ironically, it would *restrict* their ability to make good career choices. And conversely, to simply change a name to satisfy a current catch word is unfair to both the curriculum area of industrial arts and the concept of career education.

REVIEW OF THE LITERATURE

This section will review three major topical areas that relate industrial arts to career education. First, various philosophical positions on career education will be discussed. Second, some historical foundations of industrial arts which relate to career education will be reviewed. And last, selected contemporary industrial arts curriculum structures that meet both career and liberal education goals will be outlined.

Philosophical Positions on Career Education

Hoyt (undated) outlined three of what he calls major advocate positions on career education. The most simplistic of these philosophical positions emphasizes job placement as the ultimate goal of career education. The evaluation criteria relate to the percentage of graduates obtaining occupational employment upon leaving the educational system.

Important evaluative criteria for the job placement philosophy, according to Hoyt, are

—level of occupational skill.
—proportion of students finding employment.
—proportion of students placed directly in training related jobs.
—proportion advancing on the job.

This philosophy tends to be a narrower view of career education than the others that follow. It has much in common with vocational education. Even though in theory it could include all students, its very nature places emphasis on those entering the employment market directly out of high school. Based on its evaluation criteria, it can only take direct credit for the success of those entering the *job market* directly from its educational system. For students who go on to further schooling, the placement success must be generously shared with all subsequent educational institutions preparing students for employment. It is narrow, too, because its total emphasis is on paid employment.

A second advocate position described by Hoyt (undated) involves making work *possible, meaningful,* and *satisfying* to each individual. This is a much broader philosophy of career education. The word *work* is the first key to this philosophy. Its meaning involves much more than direct job placement. Work here means purposeful efforts to produce benefits for one's self or other human beings. This includes *unpaid* as well as *paid* work. The term *work,* as defined above, has been defended as acceptable to all educators. Hoyt (1975) contends that

> if career education fails to bring emphasis to education as preparation for work, it will alienate most vocational educators from the concept. If we emphasize only paid employment, we will alienate the growing humanistic element in American education who sees, all too clearly, the dehumanizing aspects of many jobs in the world

> of paid and unpaid work, career education can be seen to hold clear implications for all who teach and all who learn. (pp. 117-118)

The evaluation criteria for this philosophy assign equal weight to the three key terms: *possible*, *meaningful*, and *satisfying*. The term *possible* refers to whether one is participating in the work of their choice. In addition, the *meaningfulness* of the work to each person must be evaluated along with the *satisfaction* of the worker in the workplace.

Another career education philosophy outlined by Hoyt (undated) is primarily concerned with making school more relevant to students by showing them the relationship between what they study in school and the occupational dimensions of the society in which they live. These efforts are considered powerful sources of motivation for students. The evaluation criteria relate to pupil achievement, satisfaction with school attendance, and student behavior and discipline.

By 1974 the second of these philosophies, involving emphasis on *meaningful* and *satisfying* work, had become a part of the U.S. Office of Education career education policy (Hoyt, 1975, pp. 17-33).

Appropriate Teaching Methodology and Curriculum Foundations

Wilson and Rutan (1977) have been critical of the traditional curriculum in which attempts are made to divide knowledge into disciplines to be "covered" and learned by students. They reason that if college graduates, the ultimate product of this kind of system, report that they are not adequately prepared for their jobs, there is a need to change the system. The knowledge explosion in the postindustrial society makes the

> personal acquisition of bodies of information a meaningless race against time. While schools continue to produce people who "know", the job market is also asking for people who have skills and style of "doers"—people who can communicate with others, who can manipulate data, who can find and solve problems, who can use data to make decisions. (p. 25)

Wilson and Rutan (1977) believe that the career education curriculum must begin with new, realistic assumptions about knowledge. They believe that many of the generalizations that students should develop should still be based on facts, but the teaching methodology should change. They propose a career education curriculum that "allows knowledge to assume its vital role as a *tool* of the human mind" (p. 26). They reason that

> when knowledge is experienced as something to use rather than something to learn, students more willingly acquire the most frequently applied general knowledge. Career education is founded on the assumption that *knowing is the beginning and not the end of the learning process.* (p. 26)

The authors label this form of career education as the task-oriented curriculum because students experience knowledge as a tool through a series of tasks rather than subjects learned. In it, learning is the process of building models, testing them, and carrying on real-life activities. As Wilson and Rutan describe it,

> It is the process of growing vegetables, building museums, writing books, teaching the class next door, creating documentary films, safety-testing consumer goods, and solving community problems. It is *not* the same as inquiry learning, which leads to planned discoveries and predetermined answers. By comparison, the task-oriented curriculum is composed of tasks that are *real* rather than "dummy"—tasks that engage students because they have an immediately recognizable meaning and purpose. (p. 27)

Wilson and Rutan conclude that the task-oriented curriculum teaches content better than curriculum that focuses directly on the content. They quote Engle and Longstreet who say that throughout life, we view the world as a series of questions, topics, and problems and not as disciplines as catagorized by scholars to give us knowledge free from time and place (Wilson & Rutan, 1977, p. 27).

As Wilson and Rutan pointed out in an earlier statement, our education systems need to be producing more than "knowers"; they must be producing "doers." Good industrial arts programs with the right kind of broad career education emphasis can do this. After basic knowledge is learned or made available to students, the important part of their education begins. This involves interaction with technology in such a way that students will: develop practical understandings; manipulate tools, materials, and ideas; make decisions; solve problems; and achieve a "doers" understanding of many careers in industry and technology.

Important Industrial Arts Contributions to Career Education

The opening paragraph of this chapter enumerated three important contributions that industrial arts should be making to career education: technological society awareness, personal self-realization, and essential skills development. Why these components are vital to a good career education program will be discussed in this section.

Technological Society Awareness. Few persons dispute the position that our society is technological in nature. Contemporary industrial arts programs provide an organized study of our industrial/technological society. No other curriculum area of the school provides this kind of broad, yet direct practical study of this phase of our society.

Mamel and Sterry (1972), in reporting on the contributions that industrial arts can make to career education note that

> industrial occupations in today's world are in the fields of manufacturing, construction, communications, energy, and transportation. These fields also utilize the materials, processes, techniques, and sophisticated technology needed to produce goods and services for man. Career literacy will result when students are exposed to the many facets of this real working world; when they understand the inter-relationships which exist in the complex industrial system; and when they can, on their terms, explore an area of interest and assess themselves in relation to its demands. (p. 148)

Curriculum development authorities in the field of industrial arts agree that for industrial arts to serve its purpose as liberal education and good career education it must be broad in scope. In fact, Maley (undated) emphasizes the importance of a broad-based approach when he reports that

> if the school or the educational profession does not want to be guilty of decision making for students, or channeling their interest, there must be the broadest possible societal portrayal and involvement. (p. 5)

Broad-based, contemporary industrial arts programs can provide students with the background needed to make intelligent, informed career decisions. Less than adequate programs, in essence, deprive students of a liberal education, thus limiting their ability to make wise career choices.

Lux (undated) puts this relationship between liberal and career education in perspective for industrial arts curriculum developers when he emphasizes that "career education is about the application of knowledge, it is not the substance of a liberal education" (p. 3). A good liberal education, the study of industry and technology in this instance, will go far toward providing good career education. Lux uses an example from basic grammar studies to support his point:

> How to construct a sentence, how to write a letter, and how to punctuate are part of the substance of rhetoric. Only an individual makes the choice of whether to use that knowledge for generating

> personal correspondence or a best seller or both. And regardless of the choice made at a particular point in time, every individual still must gain the knowledge if he would be literate. (p. 3)

Olson (1974) expresses a similar point of view about technological literacy when he writes that

> for us in industrial arts, recognizing the changing nature of the technological culture and understanding the nature, causes, and impact of cultural change on man as an individual is prerequisite to knowledge of the so-called world of work. . . . The better our students understand the nature of the technological culture, the more realistically they can look at work and themselves in it. This must be our major concern if our occupational function is to be really functional. (p. 36)

A good grasp of the structure and functions of our industrial/technological society along with its problems, challenges, and accomplishments will do much to provide a liberal education to youth and at the same time prepare them well for career choices at all levels from researchers to managers, to salespeople, to machine operators, to custodians.

The laboratory setting of most industrial arts programs contributes much to the students' understanding of the content and activities of a particular curriculum area. Maley (1972) notes

> that laboratory experiences permit realistic involvement with the elements of an industrial-technological society in ways that promote maximum understanding as well as a high level of societal exploration. The laboratory permits the actual carrying out of life-like and concrete experiences typical of those in the world outside of the school. (p. 11)

The industrial arts laboratory provides students with in-school experiences that duplicate in many ways that of our technological society. It is sorely needed by *all* students for them to be technologically literate and to make informed career choices.

Personal Self-Realization. Goldhammer (1972) has stated that "the primary purpose of education is to assist the student to become a fully capacitated, self-motivated, self-fulfilled, contributing member of society" (p. 125). Industrial arts can contribute much to helping youth achieve a high level of self-realization.

Lauda (1978) also explored the need for self-realization while discussing career education as a new frame of reference for education. He considers this new frame of reference as "one that gives all persons the right to plan their total life experience with full awareness of their own capabilities, while becoming aware of all alternatives open to them" (pp. 235–236). Lauda goes on to mention dangers faced by career education, most of which relate directly to self-realization of students.

—the use of a single criteria to judge all persons as they seek purposeful activity.
—forcing people into inescapable work roles.
—failure to see the potential in interdependent systems for educating people.
—failure to recognize that people must continually engage in reeducating themselves in order to hold a job and in order to rejuvenate the "self."
—failure to recognize that people can make careers of activities which do not provide pay.
—view education as an economic investment rather than as an investment in people.

and, most importantly

—failure to recognize that involvement with purposeful activity is the ultimate goal of life as long as it does not interfere with the rights of others.
—failure to distinguish between jobs and work, that is between working for pay and purposeful activity. (p. 236)

Herr (1972) suggests that a broadening of program goals in career development has occurred, with a shift from "a Parsonian model of matching man and job to a model more committed to the clarification of those aspects of self—e.g., interests, capacities, values—which need development for a lifelong process of planning and decision-making" (p. 73).

Maley (1973), developer of the Maryland Plan for Industrial Arts, lists self-understanding as one of three important career education components of the curriculum plan. He writes as follows:

> Fundamental to any degree of effective career decision-making is the issue of "self-understanding." There is no other starting point if the decision is to be made by the individual. Exploration is not directed toward woods, metals, plastics, papers and textiles, but rather toward the human component. (p. 53)

In summarizing the importance of self-realization to career education, we return to Hoyt's definition cited early in this chapter in which he includes the terms *meaningful* and *satisfying* work as the result of successful career education. It seems safe to assume that programs emphasizing self-realization as a primary goal would develop students who could make more personally meaningful and satisfying career choices than programs not emphasizing self-realization. In other words, it would seem that an emphasis on what is "in there" with the student—their interests, competencies, and weaknesses—is a more direct approach to career education than an endless study of what is "out there"—a constantly evolving series of occupations.

Essential Skills Development. The most obvious of the essential skills developed in industrial arts are the technical skills. How to shape metal to close tolerances, how to construct with wood, how to form industrial plastics, and how to connect an electrical circuit are but a few examples. There are, however, opportunities for the development of many other essential skills through contemporary industrial arts programs.

Herr (1972) alluded to something more inclusive than manipulative skills for a person to be employable.

> While the attainment of such narrowly defined skills has validity in some isolated situations, the present dynamics of the occupational structure lend little credence to the generalized importance to education of such goals in responding to the future.
>
> Rather, the skills necessary are those by which one can use his capabilities, whether limited or great, freely and responsibly in ego-involved activities which contribute both to individual fulfillment and to society's maintenance and progress. (p. 64)

Herr's career model includes the factors of attitudes, knowledge, and self-concepts in addition to technical skills that help motivate choice and decision-making styles (p. 101).

Maley (1972) outlines four major fundamental skills that are developed in good industrial arts programs. These are manual (technical) skills, communication skills, social interaction, and problem solving. These skills are developed through making presentations, writing reports, planning with others, leading and following others, and developing inquiry, analyzing, and evaluating capabilities (p. 13). All of these skills in addition to technical skills allow students to be better informed about their own capabilities and thus help them to make better career decisions.

CONTRIBUTIONS THAT INDUSTRIAL ARTS CAN MAKE TO CAREER EDUCATION

Very little has been suggested thus far about specific program examples that reflect a contemporary study of industry and technology. This section will discuss such curriculum structures and provide examples of how they contribute to career education. It should be pointed out that contemporary curriculum thinking has progressed much beyond the woods and metals courses based on trades that originated at the turn of the century. In fact, some curriculum developers prefer the newer term of *technology education* to that of *industrial arts* to describe the contemporary programs.

Many developers of contemporary curriculum generally agree that industrial arts content should be grouped into three major clusters: production, communication, and energy and power. The following section will explore these in more detail.

Production Technology

Production includes the study of materials and processes and how systems are organized and managed by people to produce products. The materials and processes studies, often the ultimate goal in more traditional industrial arts programs, are only part of a good contemporary program. More important to understanding how our complex industrial and technological society operates is experiencing first-hand how materials, processes, and large numbers of people are managed to efficiently and profitably produce products to meet consumer needs and wants.

Production programs normally include the introductory studies previously mentioned—materials and processes. These are followed by two types of production technology studies—manufacturing and construction. Manufacturing involves first-hand laboratory experiences with how large numbers of people use materials and machines to produce products in quantity. Construction as a curriculum area includes how people work together produce a structure at a particular building site. Both of these programs often involve organizing student enterprises to experience first-hand the various roles involved in production businesses.

These programs not only give students a good *liberal* education about our society, but they also provide effective *career* education experiences. The following examples relate to some of the career education opportunities in the production clusters.

Production: Selected Career Education Experiences

The following examples are but a few that help industrial arts students make better choices about work and leisure-related opportunities:

1. hands-on experiences in using tools and machines.
2. communicating through illustrations.
3. designing products based on consumer needs and wants.
4. conducting market research.

5. making decisions based on research.
6. working with others in managed team efforts.
7. designing production tooling for producing products in quantity.
8. designing inspection systems.
9. designing and producing advertising systems.
10. designing sales systems.
11. developing financial plans.
12. working on a production line.
13. working as a salesperson.
14. managing team activities.
15. making decisions as a corporate stockholder.
16. designing structures.
17. testing structural designs.
18. communicating structural designs through drawings.
19. planning and conducting conferences with "clients."
20. planning construction projects.
21. pricing and determining construction costs.
22. erecting structures through team efforts.
23. planning model communities.

Communication Technology

The area of communication has received much attention by industrial arts program developers in recent years. One such structure identifies enterprises that convert information to messages as follows: publishing, filmmaking, broadcasting, and data processing (Steczak, 1980). Another common structure organizes communication in the areas of visual, audio, and telecommunications.

The conceptual study of communications includes much more than printing. As an industrial technology, communications can be thought of as the development, production, and marketing of information. In all of the previously mentioned divisions, communications has several common functions: encoding, transmitting, receiving, decoding, storing, and retrieving. As students learn about how information is prepared, produced, and distributed, they are exposed to many diverse career orientation experiences.

Communication: Selected Career Education Experiences

1. analyzing the audience and markets.
2. making media choices.

3. creating message content.
4. editing message content.
5. designing message formats.
6. developing illustrations.
7. preparing paste-ups.
8. preparing duplication medium (plates, stencils, masters, etc.).
9. planning and scheduling production.
10. mass producing printed messages.
11. writing scripts.
12. choosing settings.
13. staging recorded productions (film or tape).
14. processing film.
15. editing films and types.
16. broadcasting produced messages.

Energy and Power Technology

The study of energy and power technology in industrial arts involves learning about how a power system receives some form of energy, converts it, and performs work. Forms of energy commonly studied are electrical, mechanical, nuclear, solar, and thermal. Contemporary energy and power programs include much more than work with internal combustion engines. The programs focus on past, present, and future energy and power systems. The laboratory work often involves experience with working and nonworking models, construction of models, and experimentation. The content and structure of the energy and power program lends itself to research, development, problem solving, and testing of structures and systems.

Energy and Power: Selected Career Education Experiences

1. hands-on experiences with standard energy conversion and power systems.
2. conducting engine fuel tests for economy and power.
3. experimentation with wind energy conversion systems.
4. experimentation with solar energy.
5. scale model building of many types of past, present, and future energy and power systems.
6. library research.

7. conferences with authorities in energy and power conversion.
8. team project work.
9. reporting results of experimentation.

SUMMARY

Industrial arts does have a major contribution to make in career education. This discussion emphasized three areas that are contributing to career education: technological society awareness, personal self-realization, and essential skills development. Students taking part in such a program definitely improve their technological society awareness and develop many and varied skills. They have opportunities to work individually, in small groups and in larger groups. They have a chance to manage and be managed. They have the opportunity to work in libraries and laboratories on useful, exciting activities. All of these activities lead to the ultimate in education as well as career education: personal self-realization. Through a good contemporary industrial arts program, students will not only develop a better understanding of our technological society, but they will develop a better understanding of who they are and where they will one day fit into that society. Isn't that what career education should be all about?

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Chapter 7

Industrial Arts and Its Contribution to Vocational Education

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THE ISSUE

Industrial arts, the study of industry and technology, makes an important contribution to vocational education. According to the declaration of purpose in the 1976 amendments to the Vocational Education Act of 1963, vocational education should serve persons of all ages with training

> which is of high quality, which is realistic in the light of actual or anticipated opportunities for gainful employment, and which is suited to their needs, interests, and ability to benefit from such training. (Public Law 94-482, p. 1)

As stated in the act, a major purpose of vocational education is economic. Preparing individuals to meet the employment needs of the nation has been the primary emphasis of vocational education for the past 63 years.

In addition to the need for training individuals for gainful employment, the act also specifies employment that is suited to the needs, interests, and ability of individuals to benefit from such training.

This reflects the 1963 change in the goals of vocational education. The new goals emphasized the development of human potential and a shift from exclusion to inclusion. Vocational education was given a mandate to serve various kinds of people and develop programs to assist them in becoming qualified for employment (Thompson, 1972).

As a result of this new direction for vocational education, industrial arts became eligible in 1974 for federal funding. The regulations state that industrial arts programs may be funded that are "organized for the development of understanding about all aspects of industry and technology" and that "assist individuals in making informed and meaningful occupational choices" (*Federal Register*, 1977, p. 53847). Thus, by being included in the act, industrial arts has a major contribution to make to vocational education in helping students to (a) gain an understanding of the industry and technology they may become employed in and (b) discover the interests and talents they can use in making a contribution to our industrial society.

CHARACTERISTICS OF THE ISSUE

The liberalization of legislation has established a positive, formal relationship between industrial arts and vocational education. The regulations for administering the act make industrial arts programs at the middle and secondary grades eligible for funding. To receive funds, each state must include industrial arts in the annual and five-year plans for vocational education. As of 1980, 47 states had included industrial arts in their state plans (Dugger et al., 1980).

Although legislation has provided a legal and formal relationship between industrial arts and vocational education, there are numerous concerns and issues regarding the structure of the relationship. Luetkemeyer (1974) has pointed out that there are some fundamental differences between industrial arts and vocational education. Industrial arts is based on socio-psychological premises and is a part of general education that helps persons interpret the concepts of an industrial/technological society. Vocational education is based on socioeconomic premises and assists individuals in choosing and fulfilling an occupational role. According to Luetkemeyer, both types of education are necessary to fulfill an individual's life.

In an address to the Industrial Arts Division of the American Vocational Association (American Vocational Journal, 1978), Bottoms stated that industrial arts has a major contribution to make with education for work. These contributions include programs for "career exploration and decision-making, kindling the spirit of free enterprise, and the creation of industrial arts laboratories to serve as learning resource centers for hard-to-reach students" (p. 78). According to Bottoms, industrial arts teachers provide experiential activities and have an opportunity to let students reflect on their experiences as they relate to them and their career interests.

In a paper presented at the 31st Annual Convention of the American Industrial Arts Association, Larson (1969) discussed the supportive role that industrial arts should play in a total program of occupational education. He stated that individuals must have experiences that help them to decide the direction their lives should take. He advocated that industrial arts programs should

> provide experiences which are realistic and effective in the identification of interests, abilities and desires and stimulate an effective impetus towards self-realization and providing the tools for decision-making essential for determination of occupational choice. (p. 198)

According to Larson, industrial arts could make vocational education more effective by helping students identify interests and occupational goals in broad categories, and this is the greatest service that industrial arts could provide.

Steeb (1979) expressed hope that the future relationship of industrial arts and vocational education would not become sterile. Industrial arts must always regard its major contribution as preparing individuals for "satisfying human relationships in a technological culture of economics, materials, and processes" (Steeb, 1979, p. 84). This goal must be viewed as the major purpose of industrial arts for students at all levels of education.

In a national conference on the role of industrial arts in career education sponsored by the Industrial Arts Division of the American Vocational Association and the U.S. Office of Education, several recommendations were made dealing with incorporating industrial arts programs into the provisions of vocational legislation. It was recommended that industrial arts not be limited to a prevocational role in junior high and middle schools but expand the role to include programs that would serve elementary as well as secondary school students (American Vocational Association, 1972).

REVIEW OF THE LITERATURE

The role and contribution of industrial arts in U.S. education has been the subject of numerous discussions and studies. A survey of industrial arts programs in 1966 by Schmitt and Pelley indicated that industrial arts teachers and principals believed the most important purpose was to develop skills in the use of tools and machines. Other purposes considered important by teachers and administrators were providing technical knowledge and skill and discovering and developing creative talent, worthy leisure time interests, and problem-solving skills. In 1980, Dugger and his associates surveyed industrial arts chairpersons, guidance counselors, and principals about the purposes of industrial arts as a part of a project to develop program standards for the field. The survey found that skill in using tools and machines was still considered most important in terms of current and ideal degrees of emphasis by all respondents. The study also found that helping students make informed educational and occupational choices rated sixth in current degree of emphasis and second in ideal degree of emphasis in a long list of items included in the study. According to Dugger and his associates, the results suggest that principals, guidance counselors, and industrial arts chairpersons believed that this dimension of industrial arts education deserves greater attention. Also important was that industrial arts chairpersons with exemplary programs and student organizations in their schools placed great emphasis on developing an understanding of the nature and character of technology among their students (Dugger et al., 1980).

A review of the literature indicates that industrial arts has responded to the need for providing an understanding of industry and technology and helping students to discover their interests and talents. Several innovative programs have been appearing since 1960 that meet the requirements for funding of industrial arts programs under the 1976 amendments.

Although many curriculum development projects have been conducted in the past 20 years, most of them have not been adopted on a widespread basis. Perhaps the most important contributing factor has been the lack of available materials that have been field tested and revised to attain some degree of applicability.

Notable exceptions are the Industrial Arts Curriculum Project (IACP) (Lux, 1979) and the Maryland Plan (Maley, 1970). The Industrial Arts Curriculum Project at the Ohio State University developed two programs that provided learning experiences concerning industrial technology and career exploration. The first, "World of Construction," studies construction technology. The second, "World of Manufacturing," examines systems used to manufacture products. Students use tools and materials to produce products representative of those constructed on a building site or manufactured in a factory. Through a series of organized activities, students learn about the careers, processes, organizations, and work environments that are used to build and produce finished products.

The IACP curriculum has had a great impact on industrial arts programs throughout the nation. According to Lux, about 8,000 teachers have enrolled in workshops in about 125 colleges and universities. It is conservatively estimated that about 350,000 students studied IACP in 1976 in approximately 3,000 junior high schools across the country (Lux, 1979). A major contribution to successful acceptance of the Industrial Arts Curriculum Project by the profession has been the commercial availability of the materials.

The Maryland Plan, developed at the University of Maryland, is another approach to industrial arts that teaches students about industry and technology and helps them discover their interests and talents. This program emphasizes the growth and development of students as opposed to the acquisition of prespecified content or skills. Students in the seventh grade use an anthropological unit method in which technological accomplishments, such as the development of the steam engine and its contribution to civilization, are selected and studied by students. Personal involvement in researching the topic, constructing a model of the tool or machine, and presenting the findings help students meet various developmental tasks.

In the eighth grade, an in-depth study of contemporary industry through a line production experience and a group project provide students with the opportunity to role-play and interact with peers in trying out several occupations found in a modern industrial organization. Seminars and informal discussions assist students in examining their own interests and making tentative decisions about how their talents might contribute to society.

The ninth grade consists of a multiple opportunity program that includes unit studies, group projects, and a research and experimentation option. Students play the role of research workers and apply the principles of science and mathematics with tools, materials, and products (Maley, 1970).

Another approach to industrial arts that is currently being implemented is based on the study of technology. DeVore (1966) proposed that an analysis of technology be used to determine the content of industrial arts education. Three major technological areas—production, communication, and transportation—were analyzed. DeVore and his associates are preparing instructional materials for use in industrial arts programs. The materials emphasize the development of technology, current practices, and future trends through the use of manipulative experiences. Students are provided with learning experiences which require them to gather information, analyze, and use it to solve problems.

CONTRIBUTIONS INDUSTRIAL ARTS CAN MAKE TO VOCATIONAL EDUCATION

Industrial arts can contribute to vocational education by the role it plays in helping students understand the industrial and technological aspects of society and assisting them in making career decisions. The study of technology and how industry uses technology to produce goods and services is a primary purpose of industrial arts education. It is important that students comprehend the nature of the industrial and technological society in which they are preparing to live. Experiences in industrial arts programs will broaden an individual's knowledge of how our industrial society functions. These experiences can assist students in (a) developing an appreciation of their technological heritage, (b) understanding current industry and technology in dealing with the present, and (c) recognizing the industrial and technological developments that may impact on their lives in the future. Each of these objectives will be discussed in the following section, with an emphasis on the major contributions each makes to the goals of vocational education.

An appreciation of the contributions that industry and technology have made in the growth and development of civilization is an essential component of understanding the factors that have shaped our present society. Students preparing to enter the work force should have some grasp of how and why American society became so highly industrialized. The study of technological developments and their impact on the change from an agrarian to an industrial society is a vital characteristic of a well-prepared student for any vocation.

Industrial arts education has an important contribution to make in helping students realize the value and influence of technology on American history. The manipulative activities in an industrial arts laboratory can be effectively combined with cognitive experiences, showing the relation between technological developments and the transformation of America into a complex, industrialized society.

Students preparing for a special occupational role must understand the technological forces that shaped the industrialized society they will share and control. Students must understand and appreciate how the occupations for which they are preparing are the results of technological developments, which also led to specialized concentration of capital, development of large urban centers, and highly organized groups of labor and management to control the production of goods and services. Understanding technological and industrial developments and their impact on an industrialized society is a significant contribution that industrial arts can make to the education of young people who are preparing to enter the world of work.

A primary purpose of industrial arts education is to provide an understanding of contemporary technology and the industrial society in which we live. Experiences in industrial arts will develop an individual's knowledge of how our industrial society functions. This knowledge will provide a conceptual framework the individual can use in recognizing how occupational roles fit into a broader and interdependent relationship in the organization of society. For example, students can gain insight in and appreciation of the contributions individuals in various occupational settings make by role-playing in a mass-production experience in an industrial arts laboratory.

The recognition that each individual plays an important role and has a worthy function to fulfill in the production of a product or service is an important outcome of industrial arts that can make a valuable contribution to the growth and development of young people. One of the most critical "employability skills" that students need to obtain is a feeling of value and worth about the contributions they make in fulfilling their occupational role in society. The experiences received in an industrial arts program can help develop attitudes and values needed to participate positively in society.

An understanding of the industrial and technological developments that will have an impact on the future is another contribution that industrial arts can make to students selecting and preparing for future careers. The rapid growth of science and technology, changing economic conditions, and different patterns of organizing people in work settings are just a few factors that may cause numerous occupational changes in an individual's lifetime. The use of new technologies and their application in solving problems of the future need to be recognized by young people. The problems concerned with energy resources, environmental quality, and increased productivity will require the application of appropriate technology to their solution. It is especially important that individuals are cognizant of various kinds of technology that are being advocated to solve problems and recognize the societal needs and values that will be affected by these technological systems.

The solution of tomorrow's problems will require a well-informed public that can participate and choose among various alternatives. In this regard, industrial arts education has a role to play in preparing students to be technologically literate and use that knowledge in making intelligent decisions that will affect their social, environmental, and economic well-being.

Finally, industrial arts has a valuable contribution to make to vocational education in helping individuals make decisions about the type of occupation or career they might pursue in life. The experiences and manipulative activities found in an industrial arts laboratory provide opportunities for students to develop an awareness of their interests, aptitudes, and abilities. A second dimension of the process is an awareness of the career opportunities that are available. In learning about technology and industry, students are introduced to concepts and industrial practices, such as product design, marketing and distribution, quality control, industrial process, and organization. The simulation of industrial practices in an industrial arts program provides an opportunity for students to become acquainted with and explore a range of occupations needed by society. Exploration of these occupations through role-playing and simulated experiences provides an opportunity for students to reflect and relate them to their own individual values and capabilities. As a result of exploratory experiences in an industrial arts program, students should be better prepared at all levels to make informed career decisions and enhance their ability to do occupational planning that is suited to their needs, interests, and ability to benefit from further training.

Developing students' understanding of industry and technology is the primary purpose of industrial arts education. The major purpose of vocational education is to prepare individuals with the technical skills and knowledge needed by society. The demands of a highly technical and industrial society require that both kinds of preparation play an important role in the education of young people. The relationship of industrial arts with vocational education recognizes that occupational competency is essential to the psychological and economic well-being of all individuals. In addition to specific job preparation, however, it is essential that individuals have technological and industrial understandings related to the world in which they will function. Industrial arts can contribute greatly to vocational education by widening the horizons of students preparing for work, by helping them understand the relationship between their vocation and the technological and industrial attributes of the present, and by preparing them to participate meaningfully in shaping the post-industrial society of the future.

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Chapter 8

Industrial Arts and Its Contribution to The Guidance of Youth

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THE ISSUE

Industrial arts has a major contribution to make to the guidance of youth. The continuing progress and improvement in the quality of education for industrial arts teacher preparation has increased the teachers' potentiality for influencing the school guidance program. Failure on the part of the school to use the potential of industrial arts teachers ignores the widely accepted concept that all school professionals are a part of the guidance team.

The ever-increasing specific and conflicting demands on guidance counselors have preempted their ability to function optimally in a role of guiding the development of the knowledge and attitudes of students required for effectively adjusting to the world of industry and technology.

The field of guidance counseling has experienced a great deal of progress, which has led to many new theories and conceptual frameworks. The professional preparation of counselors has its main strength in psychotherapy, while casual observation would indicate that counselors deal mainly with educational placement and personal problems of students. Concurrently, the increasing growth of knowledge and research findings in the field of guidance, industrial psychology, and industrial sociology have led to changes in industrial arts. Influenced by the emphasis of humanism in industry, progressive teacher training institutions have developed new activities for the study of industrial arts. The emphasis in industrial arts education on the psychological, sociological person rather than entirely on technical skills enables industrial arts teachers to contribute significantly to the guidance of youth. Unique laboratory activities closely reflecting the world of work contribute to the development of mental skills necessary for understanding oneself, making choices, experiencing social interaction, and forming attitudes and values. This discussion provides examples of practices that exemplify the potential of industrial arts for providing guidance services to youth.

Hortatory journal articles and books relate to the issue under study; however, the purpose of this discussion is to

1. inform administrators and pupil personnel workers of specific intervention activities that industrial arts teachers carry out and that support the psychological goals of guidance.
2. provide a specific model system for guidance based on contemporary decision-making and personality dynamics theory that can be replicated.
3. incorporate within the system exercises in conducting interaction analysis of modal psychological behaviors for careers and self assessments.
4. gain the confidence of administrators and other leaders in the abilities of industrial arts teachers to use their laboratories in such a way as to provide for the psychological development of students in situations similar to those found in business and industry.
5. verify that the unique preparation of industrial arts teachers in the disciplines of practical arts, technology, science, psychology, and economics brings to the school a professional point of view grounded in the real world rather than isolated theoretical constructs.

CHARACTERISTICS OF THE ISSUE

Research by Tyler (1972) and Dame (1980) supported the findings that teachers of academic subjects and administrators tend to be unaware of the rapid growth and change of emphasis in the exemplary industrial arts programs. As most of the American agencies and industry in the past thirty years have moved to humanized policies and practices, industrial arts education has also changed. The influence of the thrust for humanizing agencies and the quality of research helped industrial arts to place the development of the total individual as the center of concern. To hold to the traditional expectation that industrial arts is where only psychomotor skills are developed and where tools and equipment are used to make products is to lack an understanding of present practices.

The available literature (Ginzberg, Ginsburg, Axelrod, & Herma, 1951; Herr & Cramer, 1972) repeatedly recommends that all professionals in elementary and secondary schools should, in their unique ways, provide services to students aimed at the maximum development of individual potentialities. This would be achieved by providing school-wide, continuous assistance to youth in personal problems, choices, and decisions that each must face as he or she moves toward maturity. Further, it is evident that no theorist restricts the guidance services only to the counselor; unfortunately, many schools do. It is also evident that it is unreasonable to expect one professional to meet the needs of youth on a continuous basis where the ratio is from 200 to 600 students for each counselor. Under this student-counselor ratio when the services of the counselor occur, it becomes an event as a point in time. But if guidance is to be a continuous process, other staff must regularly and systematically function as contributors to pupil personnel services. Contemporary exemplary industrial arts programs have demonstrated the capability of assisting students in locating themselves career-wise in the future and at the same time make effective use of concurrent educational experiences. Industrial arts, as will be shown, facilitates the growth in one's understanding of important elements about the self and can provide reference points for thinking about, sorting, and evaluating alternatives for life. Experiences in industrial arts, when properly guided, can become the foundation of goal-directed behavior for career education. Attitudes, values, and interests that are needed for career choices are developed in industrial arts by the conversion and incorporation of sound guidance theories to practical systematic experiences for students. Although these ideas transcend the psychomotor skill activities, they do not diminish their importance. Industrial arts contributes to the development of the whole person because of the interdisciplinary activities and the total person involvement model.

REVIEW OF THE LITERATURE

The job of facilitating career development and decision-making cannot be done solely by the intervention strategies developed by counselors who neither have the feeling for, nor experience in, technological fields of work. Logically, the most qualified professional is the industrial arts teacher; however, he or she cannot meet all career needs; a total school effort is required. Many teachers are actively engaged in various career guidance activities and are willing to do more. The industrial arts teacher can act as a leader and organize existing efforts and form an efficient pupil personnel team, consisting of administrators, supervisors, coordinators, teachers, community leaders, and employers. Industrial arts can subsume all disciplines as is done in the reality of the world of industry. By virtue of their acts, guidance counselors affirm and recognize the value of providing realistic experiences. Witness the mass of simulation sessions, kits, and games designed by guidance specialists, yet all these fall short of what is achieved in industrial arts laboratories practicing the newer programs and strategies.

Although work experience is considered to be very effective by educators and the community, the schools provide systematic work experience for only a minority of pupils (Evans & Herr, 1978). There are financial, legal, and organizational impediments. There is no doubt that pertinent, concrete experiences are essential for guiding young minds in making decisions. Because schools and the community constrain the direct avenues for work experiences, simulation techniques may be substituted. Even the best simulation of occupational experiences (e.g., games, kits) that career specialists and vocational counselors use cannot achieve the realistic impact provided by the more contemporary industrial arts programs. In such programs, students experience responsibility for organizing, managing, planning, designing, producing, and distributing products of manufacture of their choice. Industrial arts teachers in recent years have incorporated activities that implement occupational choice theories, one of which will be presented in this discussion.

The University of Illinois Survival Skills Project (Leach & Kazanas, 1979) developed strategies in the form of twelve modules for infusion into ongoing industrial education programs. They include studies in: (a) working in organizations, (b) motivation for work, (c) understanding self, (d) interpersonal relations, (e) effective communications, (f) using creativity on the job, (g) problem solving, (h) authority and responsibility, (i) leadership, (j) coping with conflict, (k) coping with change, and (l) adapting and planning for the future. The essential characteristic of these activities is that industrial educators realize the importance of these skills, and they attempt to prepare well-organized classroom laboratory experiences to help students acquire desirable work habits, attitudes, and values along with cognitive and psychomotor skills.

Theories in the field of guidance are traced in the literature to Parsons in 1909 (Brewer, 1942). However, it is seldom recognized that an industrial education teacher, George Merrill, in a San Francisco School in 1895, was providing guidance to students by way of a program designed on the basis of a developmental approach. The first two years of this program required students to explore a range of technologies. This was followed by a period of intensive study of job opportunities and requirements of industry and self-evaluation. At this time, counseling services were available, and students were given an opportunity to choose technical studies for their last two years. Placement and follow-up were also included (Brewer, 1942). Merrill's lack of publications and supportive research allowed others to gain recognition in guidance and led to the temporary loss of the importance of experience as essential to choice and self-discovery by way of an organized systematic program.

Research evidence indicating that interests, attitudes, and work values are shaped by successful experiences has been provided in a series of studies conducted by Krumboltz, Sheppard, Jones, Johnson, and Baker (1967). The researchers set out to determine the effect that successful experiences with occupational tasks had on evidences of interest in those occupations. They hypothesized that students who had successful experiences at certain tasks would demonstrate more behaviors indicative of interest in occupations than students not provided with such experiences. Consistent results under these circumstances led to the conclusion that successful experiences do cause changes in behaviors considered to be manifestations of changes in interests and attitudes for career choices.

Olson (1965) conducted a research study of importance that gave impetus to bringing together craftsmanship, guidance, and technology. He empirically verified that industrial arts activities foster self-knowledge, positive attitudes, and values in the individual, and these were more important than the tangible products that were constructed. He concluded that it was imperative that industrial arts teachers understand and practice guidance techniques. This, he wrote, becomes more important when one views the informal learning situation and close personal contact that is apparent in the laboratories. Such settings make an ideal location for encouraging self-understanding and a means for implementing the guidance process. The teacher functions in the guidance role to provide unique world of industry experiences, while the guidance specialist acts as a consultant as a part of the personnel team. The resultant attitudes, values, interests, and self-knowledge become an outgrowth of the students' experiences.

Countless numbers of students have used Holland's Self Directed Search inventory to help them make a career choice (Tolbert, 1974). Research literature supports the soundness of the methods and concepts that form the basis for the classification systems incorporated in the underlying theory (Zytowski, 1968). Taking a test at a point in one's life, however, requires the assumption that the person has had some experiences relative to the questions. For many students to answer questions such as, "Do you enjoy persuading or leading others?" without ever having experience in this act most often will elicit an invalid response. The student is required to react emotionally to the image or fantasy evoked by the question. The construct of the above question elicits a response to Holland's occupational personal category, Enterprising. Progressive industrial arts programs provide experiences that implement all of the personal and occupational classifications of Holland's theory, and students become consciously aware of the need for special human behaviors in various careers.

A brief summary of Holland's theory in terms of occupational environments, the modal task requirements, and the modal behaviors of encumbents is presented in Table 8-1.

The framework is used for organizing and classifying industrial arts experiences. Research indicates that the six classifications include the major kinds of American work environments. In addition, the six classifications serve to organize various data about self, such as interests, values, and cognitive, affective, motor, and interpersonal skills. The primary constructs, personal and environmental, of the system have the recognized potential for a structure by levels. A hierarchy of personal development and occupational levels is an important aspect of Holland's theory. It is only through well-designed industrial arts programs, however, that these primary constructs can be incorporated for valuable student experiences.

Mietus (1979) conducted research on the feasibility of incorporating theories of guidance into industrial education. The purpose was to develop guidance intervention strategies that could be used in various industrial programs. The resulting products included three career search inventories and career search finders. These delivery systems were designed for the Communications Cluster, Construction Cluster, and Metal Fabrication Cluster.

The intervention strategies enable the teachers to systematically develop the student's ability to assess and learn about

1. attitudes toward doing or learning how to do selected occupational tasks.
2. abilities and/or lack of abilities to perform selected occupational tasks.

TABLE 8—1

A Summary of Holland's Personality Factors and Environmental Models

HUMAN REQUIREMENTS* (MODAL PERSONAL ORIENTATION)		ENVIRONMENTAL MODELS* (OCCUPATIONAL ENVIRONMENTS)	
TYPE	DESCRIPTION	TYPE	TYPICAL OCCUPATIONAL TITLES
Realistic (Motoric)	Enjoys activities requiring physical strength. Aggressive, good motor organization; lacks verbal and interpersonal skills; prefers concrete to abstract problems, unsociable; etc.	Realistic (Motoric)	Laborer, machine operator, aviator, farmer, truck driver, carpenter, etc.
Intellectual	Task oriented, "thinks through" problems; attempts to organize and understand the world; enjoys ambiguous work tasks and intraceptive activities; abstract orientation, etc.	Intellectual	Physicist, anthropologist, chemist, mathematician, biologist, etc.
Social (Supportive)	Prefers teaching or therapeutic roles; likes a safe setting; possesses verbal and interpersonal skills; socially oriented; accepting of feminine impulses, etc.	Social (Supportive)	Clinical psychologist, counselor, foreign missionary, teacher, etc.
Conventional (Conforming)	Performs structured verbal and numerical activities and roles; achieves goals through conformity.	Conventional (Conforming)	cashier, statistician, bookkeeper, administrative assistant, post officer clerk, etc.
Enterprising (Persuasive)	Prefers verbal skills in situations which provide opportunities for dominating, selling or leading others.	Enterprising (Persuasive)	Car salesperson, auctioneer, politician, master of ceremonies, buyer, etc.
Artistic (Esthetic)	Prefers indirect personal relationships, prefers dealing with environmental problems through self-expression in artistic media.	Artistic (Esthetic)	Poet, novelist, musician, sculptor, playwright, composer, stage, director, etc.

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*Terms within parentheses denote earlier nomenclature

3. personal attributes in relationship to behaviors required in jobs within occupational clusters.
4. self-awareness and career decision-making skills.
5. the interdependence of various occupations and the transference of skills to build a career after job entry.

A further clarification of the system will appear in the last part of this discussion.

CONTRIBUTIONS OF INDUSTRIAL ARTS TO GUIDANCE

The Maryland Plan for Industrial Arts (Maley, 1969) is one example of a program that has the flexibility to subsume the best theories of occupational choice. Because it places the individual as the central focus, a theory of occupational choice, such as advanced by Holland (1959), can be incorporated and implemented to provide a powerful experience for the development of the individual as well as the group. The line production and group projects found in contemporary industrial arts programs form the experiential background into which Holland's concepts and strategies can be used for developmental purposes.

It is to be recalled that Holland incorporated his theory as a test or inventory, whereas this discussion stresses converting his theory to a guidance intervention system. By this method, the theory becomes alive, and students develop insight as they engage in line production or group project activities. This approach is developmental; whereas Holland's theory assumes that at the time of occupational choice, the person is a product of the interaction of a particular heredity with a variety of cultural and personal forces including peers, parents, and significant adults, social class, American culture, and the physical environment (Holland, 1959).

Out of this experience, the person develops a hierarchy of preferred methods of dealing with environmental tasks, which Holland refers to as the individual adjustive orientation. In the act of selecting a career choice, the individual, in a sense, searches for situations (occupational environments) that satisfy his or her hierarchy of adjustive orientation (i.e., modal personal orientations or simply personality).

Holland assumes that a person has had experiences to stimulate adjustive interactions. The industrial arts program structures the opportunities for development by providing integrated sociological, psychological, cultural, and technological experience based activities (Maley, 1969).

A partial list of these activities are

1. participating as a part of a group in decision-making, sharing of information, helping others, challenging, and evaluating.
2. pursuing topics of interest to the individual.
3. using the community in new and different ways as the individual researches his or her selected topic.
4. engaging in new and involved peer relationships based on common purposes and goals.
5. using a variety of materials and products common to contemporary society.
6. using a variety of hand and power tools in new and different ways for productive purposes.
7. using a variety of communication media in presenting and researching the selected individual topic.
8. entering into a host of new and different social situations and varied forms of societal involvement.
9. experiencing the opportunity to set one's own goals and to determine the depth to which a topic or project may be pursued.
10. testing one's abilities, strengths, weaknesses, interests, likes, and dislikes.

The options open to the student are literally infinite as each pursues the many diverse facets of the industrial arts program. The almost total preoccupation with manipulative skill performance and technical knowledge, characteristic of traditional programs, is subordinated as the teacher or observer of such a program gets caught up in the realization that the student is actually an individual pursuing goals, processes, interests, and developmental tasks in ways that are unique and satisfying to each.

With deliberate brevity and omission of detail, some industrial arts activities and their interconnections with Holland's theory are presented in the following example. In the spring of 1980, ninth-grade students were observed engaged in a line production experience in industrial arts. The students elected to establish a toy manufacturing company. Students made all the organizational plans and decisions and immediately engaged in solving corporate, economic, logistic, manufacturing, and distribution problems. To resolve these problems the students had to research, learn, and execute the required behaviors of occupations and assume the psychological adjustive orientations for the roles they performed to make the company function. These are outlined and classified in accordance with Holland's classifications (Figure 8-1).

Figure 8—1
Holland's Classification of Occupational Choice

STUDENT ROLES	PERSONAL ORIENTATIONS AND MODAL BEHAVIORS
BOARD OF DIRECTORS: Business Manager Sales Manager	ENTERPRISING Students in this role were required to use verbal skills in situations which provided opportunities for dominating or leading others. They had to show concern for power, status, leadership aggressiveness, confidence and exert a high energy level in setting up economic goals and attaining organizational aims.
ENGINEERS: Design Plant Industrial	INVESTIGATIVE OR INTELLECTUAL Students in these roles were required to think through and solve scientific and technological problems. They at times had to work with ambiguous tasks independently for long periods of time. They had to think through rather than act out problems.
INDUSTRIAL RELATIONS: Manager Sales Manager Educational Director Shop Steward Personnel Director	SOCIAL Students in these roles were required to be sociable, humanistic and be central in a group. They had to use verbal interpersonal skills and solve problems through feelings. They were required by the role to be understanding and responsive to human concerns.
FINANCE Comptroller Quality Control Accountant Procurement Director Safety Director	CONVENTIONAL Students in these roles were required to do well-structured activities. They had to use verbal, numerical and conforming systems and to employ clear cut procedures. They had to be efficient, orderly and conscientious with details.

DESIGNERS: Product Draftsperson Sales Catalogue and Advertising Director	ARTISTIC Students in these roles were required to deal with aesthetic problems. They had to express creativity through various media. They had to produce unique products at different levels using intuitive feelings to make objects attractive.
CRAFTSPERSONS: Die Maker Jig and Fixture Maker Pattern Maker Set-up Person Machine Operator Assembler Packer and Shipper	REALISTIC Students in these roles were required to use psychomotor skills, power tool equipment and machinery. They resolved concrete problems by empirical testing and manipulative devices. Physical strength and dexterity came into play.

The reality-centered activities required in the occupational roles and the modal human behaviors are only outlined. For further clarification and more specific information, reference should be made to the document, *The Maryland Plan for Industrial Arts Junior High School and the Behavioral Task Analysis Approach* (Maley, 1969). A review of the roles and experiences presented in the above outline clearly points out the misconception of viewing industrial arts only in terms of the realistic classification. Similar to the real world of industry, a lesser portion of effort in an enterprise involves manipulative skills.

Guidance through industrial arts is a process by which an informed, experienced, mature person guides the development of students through properly planned learning activities. Of great importance in this process is evaluation. Does the student know that he or she changed because of the experience? Mietus (1979) created a Career Search Inventory (CSI) incorporating Holland's dimensions designed and used by industrial education teachers. The CSI is a method to help students in getting thoughts together and developing the rudimentary skills of processing complex interacting variables. It is adaptable to any type of industry selected for study by the students.

The objectives of this system are to enable students to assess their ability to

1. make distinctions between job tasks of industrial occupations in terms of Holland's categories (i.e., Realistic, Investigative, Social, Conventional, Artistic, and Enterprising).

2. list the tasks they can do or aspire to do and trace these through the occupational structure of the selected industry under study.
3. list the main human requirements for a series of occupations arranged in a hierarchical order and to classify these with Holland's categories.
4. trace upward mobility of various occupational incumbents with a preferred set of modal behaviors.
5. list the mental steps for integrating interests, abilities, and modal behaviors required for career decisions.
6. list modal skills that are necessary in various levels of occupations.
7. trace linkage between modal behaviors, job tasks, and occupations in an integrated functioning industry.
8. relate self-assessments to a cluster of modal occupational behaviors.
9. relate school subject content to occupational requirements within selected industries.

The system as presented above was not intended to be a test. Readers familiar with Holland's Self Directed Search (SDS) at this point are perhaps in need of a clarification of the differences between the SDS and the CSI delivery system. Having worked with the SDS, the following shortcomings were found for using it in industrial arts.

1. The occupations it deals with lack homogeneity, and these are of a wide diversity, including professions that are not directly or systematically related to the thrusts of industrial arts. It is more appropriate for use by counselors and career guidance specialists who want a general idea of students interests and abilities.
2. Interpretation is too cumbersome and time consuming for the industrial arts teachers. It places them in a situation in which they are required to deal with occupations out of the main thrusts of industrial arts.
3. It does not have the continuity of the interdependent occupational links as found in industry and commerce or industrial arts.
4. It was not designed for use as a teaching device for industrial arts education. It is based on the DOT system. As such, it in many cases departs from the true dynamics of commercial and industrial organizations.

Holland's SDS classifies the industrial arts teachers as "realistic." Working with 200 industrial arts teachers who were familiar with the system, it was found that they tended to classify themselves as social, intellectual, and realistic. Many other such differences were found. This is not to say that the SDS is not good as research indicates; it has good uses for guidance counselors.

Industrial arts teachers view the function of the incumbent in his or her role within the environment. As an example, consider the Capital Commercial Residential Remodeling and Restoration Company (the name only is fictitious). The owner of this company is very active in negotiating loans, locating new contracts for projects, investing company profits, and working with community agencies. He has verbal skills; is persuasive, aggressive, and dominating; and possesses leadership qualities. Because he exhibits and uses these behaviors a great deal, he is classified as Enterprising (E). Other occupations that fit this behavioral description are car salespeople, auctioneers, masters of ceremonies, politicians, buyers, owners of business enterprises, and so forth.

This company has in its employ an architect, an electrical engineer, and a structural engineer, all professionals who must apply concepts of sciences and the science of materials and calculate loads, stresses, energy needs, and other construction factors. Their work is often very abstract; they must think through problems and organize a plan of action. These types of behaviors are classified as Intellectual or Investigative (I). Other occupations that fit this description would be less demanding but nevertheless qualify as intellectual and investigative (e.g., building code inspectors, contract writers, estimators).

The company also has in its employ architectural designers, draftspersons, interior designers, and illustrators. These employees must express ideas through various media that have appeal, meaning, and a desired effect on people. This is a form of arts, so these employees and their jobs are classified as Artistic (A). Other examples of Artistic job behaviors are wood carvers who are restoring building components, painters, cabinetmakers, and ornamental wood finishers. These jobs enhance the beauty (aesthetics) of residential and commercial dwellings and their furnishings.

In the Capital Company are people who work in the trade occupations (e.g., masons, electricians, carpenters, iron workers) who have physical strength and psychomotor skills. They operate power tools, hand tools, machines, and equipment. These workers mainly work with things rather than abstract problems. This group of occupations and worker behaviors are called Realistic (R).

The company has a union leader, a union steward, and an ombudsman. These people were carpenters and plasterers before they were voted into these positions. They had the ability to speak to the management in behalf of other employees and were sensitive to the feelings of their fellow workers. They also set up retirement parties, company picnics, and are outgoing and sociable. Their behavior and the jobs they hold are called Social (S). Other occupations that have a social classification are industrial arts teachers. They may have been classified as realistic when they worked in industry; but when they become teachers, they have to behave and function more on a supportive level and work with a variety of people. Therefore, an industrial arts teacher could be classified Social, Intellectual, and Realistic (SIR).

In the company are employees who must keep exact records, books, files, schedules, stock inventories, material stock, employee time sheets, and so forth. Their work follows strict regulations and depends on the performance of others. Many of their job tasks require strict conformance to the company's operations. These human behaviors and jobs are called Conventional (C). Other occupations that fit this description are payroll cashier, office clerk, stockroom keeper, yard keeper, janitor, equipment oiler, tool and machine cleaner, security guard, and cashier.

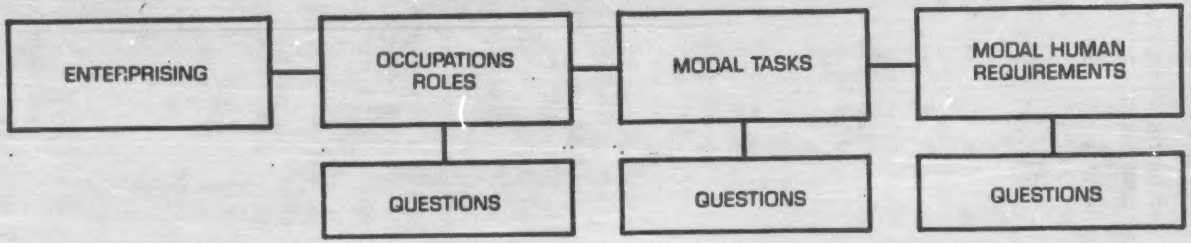
Many types of industries are selected by students for study in industrial arts. This requires the instructor to generate software describing the classification terminology as provided in the above example. A clarification of terms used is incorporated in the introductory part of this learning package which acts as a delivery system for guidance, psychological, sociological, occupational, and self-assessment. Each student receives a learning package, which is designed to include the following:

Part I. This part includes a description of how the CSI is integrated with the industrial arts studies, definition of terms, questions leading to insights about themselves, how to make self-assessments in relationship to the experiences, and how to think through their own needs for careers.

Part II. Similar to Holland's SDS, this part requires students to list in chronological order their career aspirations from the earliest point of memory. In the process of using the learning package, students gain insight into the need for experiences to make realistic assessments about themselves in relationship to careers.

Part III. This part consists of questions designed to elicit attitudes, likes, and dislikes based on psychological, sociological and psychomotor factors that occur in the experiences from the study of industry. The model for this part is shown in Figure 8-2.

Figure 8–2
Model for Examining the Human Factors in the Study of Industry


ENTERPRISING
OCCUPATIONS ROLES
MODAL TASKS
MODAL HUMAN REQUIREMENTS
QUESTIONS
QUESTIONS
QUESTIONS

This process is repeated for the categories of Realistic, Conventional, Social, Investigative, and Artistic.

Part IV. This part is designed similarly to the scheme above except that students are required to assess themselves in terms of what they can do, and what they would like to pursue either for study or a career.

Part V. This part requires students to think in terms of their abilities, interests, and preferred behavioral roles in relationship to a cluster of occupations within and related to the industry under study. This is depicted by the model in Figure 8-3.

The system enables the students to look within themselves. With the knowledge gained by participating in the program, they can mentally relate to categories and levels of occupations.

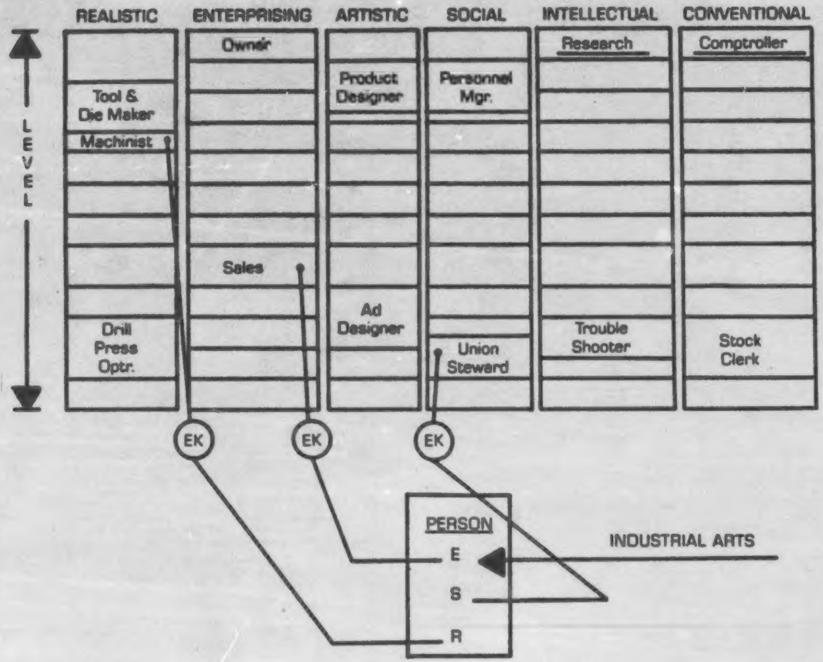
The Experience and Knowledge (EK) gained in the course help the student make realistic appraisals in terms of jobs they may be qualified to do and what they need to learn how to do to enter into and/or progress in a given category of occupations. The students learn that there are several levels of choices and that each choice (all not depicted in model) up the scale requires additional knowledge and training. Students are stimulated to sharpen their perception about their level of competence, potential competence, and self-estimate of their worth with respect to others with whom they participated in the industrial arts program.

Figure 3 depicts the interaction for a student with an Enterprising, Social, Realistic (ESR) orientation, or patterning, at various levels of choice. The Experiences and Knowledge (EK) gained enable the student to have a well-defined developmental pattern of orientation. Students who do not have industrial arts experiences may never have the power to make sound occupational decisions that involve complex variables. They may have mental blocks to choices because they lack exposure to the experiences in industrial arts.

Industrial arts programs set loose culturally imposed and self-made limits and enable students to differentiate between occupations and human requirements with a realistically expanded view. The self-image develops on the basis of knowledge tested and on experience gained rather than abstraction. Self-knowledge and occupational experiences operate to facilitate the decision-making process even if they are tentative. The student engages in experience in how to think about and bring together, in a systematic way, career variables that most often are processed independently of one another (see Figure 1).

Part VI. The system requires the student to summarize data from the previous parts, to code these, and make graphic profiles of their

Figure 8—3
Toy Manufacturing Company


REALISTIC
ENTERPRISING
ARTISTIC
SOCIAL
INTELLECTUAL
CONVENTIONAL
LEVEL
Owner
Research
Comptroller
Product Designer
Personnel Mgr.
Tool & Die Maker
Machinist
Sales
Ad Designer
Drill Press Optr.
Trouble Shooter
Stock Clerk
Union Steward
EK
EK
EK
PERSON
E
S
R
INDUSTRIAL ARTS

abilities, interests, preferred social psychological behaviors, and self-assessments as related to the other participating students in the industrial arts class. This integration component is followed by directions on what and how to conduct further study on one's own career development.

After completing the learning package or delivery system, the industrial arts teacher conducts group and individual guidance sessions. The goal is to clarify for students the meaning and value of the experience of the course and the system. The sessions also aim to enhance the operation of reason in the dynamic process of career development and to help students gain confidence in making and acting on a particular decision as well as in viewing decisions in relation with those that are possible.

Other important points of this discussion that need to be emphasized are that industrial arts (a) enables a search for identity and provides opportunities for students to shape and mold self-perceptions consciously through experiences; (b) expands the students' consciousness of what is possible for them in the world of industry and commerce; and (c) helps students identify and test their feelings, attitudes, and values related to the real world.

An informal analysis of curricula for preparation of various teachers reveals that industrial arts teachers are prepared in one of the best-balanced curricula central to the guidance of youth. Their curricula include an integrated blend of technical, humanistic, sociological, and psychological courses. It is not unusual to hear complimentary statements from college professors of academic courses praising the ability of industrial arts majors to creatively translate theoretical constructs into activities for use with students in industrial arts. Too often the psychomotor activities performed in the laboratory shape the perception of the uninitiated. This blinds them to the true nature of industrial arts and its values in the guidance process.

It was intended that this exposure of only one intervention strategy used by industrial arts teachers would cause responsible administrators, counselors, and teachers to reassess their professions and question their assumptions in the light of changes in all fields of education. All occupations and perceptions of other disciplines should be subjected to reexamination, and those which are obsolete should be abandoned. Schools should give appropriate support and concern to the reality-based activities of industrial arts.

Finally, there is good reason and evidence to support the expectation that industrial arts has a major role to play in the guidance of youth. It is experientially based in the broad occupational framework of the study of industry and technology.

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Chapter 9

Industrial Arts and Its Contribution to The Improvement of Reading

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THE ISSUE

The central thrust of this presentation is that industrial arts has a significant role to play in the improvement of reading at the elementary and secondary levels. This assertion is made in recognition of the role that the subject matter fields have in the improvement of reading. The specific linkage with industrial arts is due to the realistic, concrete, and experiential nature of the student's involvement with the content of the area.

CHARACTERISTICS OF THE ISSUE

Beginning in the 1950s educators and politicians around the world have been particularly concerned with the problem of illiteracy. This problem is complicated by the fact that it must be dealt with at two levels: the school age level and the adult level. Philips (1970) estimated that in the 1960s the world's illiterate population numbered 810 million. He considers it paradoxical that at a time when men were landing on the moon, there were 810 million people in the world who could not read, write, or do simple arithmetic. While it is a generally accepted fact that the greater majority of these illiterates live in underdeveloped or developing countries, illiteracy is not peculiar to the underdeveloped or developing world. According to United Nations Educational, Scientific and Cultural Organization (UNESCO) publication on Literacy 1972-1976 (1980)

> Many countries which have had an elaborate system of free compulsory education for generations have been surprised to discover that they have to contend with a serious illiteracy problem involving 5 percent of the population in Italy, 4 percent in the United Kingdom, 10 percent in the United States of America, and 7 percent in Canada. (p. 10)

These figures relate only to the indigenous population and do not include illiteracy among certain immigrant groups.

Americans live in an advanced technological and scientific society. The ability to read and write is required for functioning, both in the routine and in the more complex activities of life. This writing and reading ability may, in many cases, be necessary for survival. Karlin (1964) supports this position in the statement

> Although the ability to read may not be for everyone an end in itself, outside our schools the demands of this modern world underline ability to read with skill. Daily living, jobs and a satisfactory place in society depend somewhat on the ability to read, while an age of science, space and propaganda demands citizens who are able to read and think critically. (p. 4)

In every sector of the populace, there is expressed concern about adult literacy and, more particularly, the increasing numbers of students leaving school without functional reading ability.

Within recent times a high school graduate who found it difficult to cope with the demands of his chosen career sued the San Francisco United School District. He contended that the school district was amiss in issuing him a high school diploma, even though he was, allegedly, reading at about the fifth or sixth grade level. Subsequently, in a conference with educators and lawyers, one judge expressed the fear that the above and similar law suits could cost in the billions of dollars. The judge's fear might be well founded in light of repeated reports from employers, who cite the inability to read and write as a primary reason for denying recent high school graduates employment. Another indication of reading and comprehension problems among high school graduates is the recent steady decline of Scholastic Aptitude Tests (SAT) scores.

These few selected examples are a mere indication of an alarming situation. The educational community has responded with an ever-increasing number of reading programs and clinics, the development and formation of professional associations, more money for research and experimentation in the area of reading improvement and the involvement of content area teachers in the search for a solution. In addition, a singular outstanding response has been the involvement of the local councils of the International Reading Association in the celebration of International Literacy Day, September 8, 1980.

As previously stated, the ability to read is necessary, not only for adequate functioning in society, but for survival. Reading ability should be a valued skill, cultivated in early childhood, fostered and improved throughout life. In order for the child to get the right start at the earliest possible opportunity, parents should have an understanding of the developmental skills that contribute to reading ability, and be able to help the young child to develop them. Reading is so important to an individual's future, parents should be alert to the necessary reading readiness steps to undertake with their children. These include the playing of appropriate games, helping the child listen to words and sounds, speaking clearly and distinctly, involving the child in conversation, and providing an adequate supply of picture books. Neglect of this aspect of child growth and development could well be the primary source of reading problems among our school age and adult populations.

Even with the most appropriate teaching techniques, children may experience failure at reading because they do not see the need to read. Motivation, then, is a factor in reading development and improvement. In the absence of the desire to read, reading becomes an exercise in futility and the experience of discovery and learning is lost. Inquiry into students' interests, their experiences, backgrounds, their education goals and career aspirations should precede the selection of reading material.

This is not to suggest that all the reading material be within a narrowly defined domain. Indeed, the child needs to be exposed to a variety of reading materials at varying levels, but since the reading habit has to be cultivated, it will be well to consider the child's areas of interest.

A multisensory approach to any learning activity yields better results than when only a single sense is involved. In some cases, it is even illogical to expect learning without the use of more than one sense. Information received exclusively by reading words leaves voids in learning. For example, there is no way to adequately describe the experience of a cold glass of lemonade on a hot summer day. Nociti's research (1976) indicated a definite relationship between sensory transfer skills and reading achievement. She further stated that it appears that sensory integration is an important factor affecting reading progress.

As a society we are bombarded with radio and television programs, designed to entice and excite. Many a youth has fallen prey to the lure of the electronic media. Waters (1977) figures that by the time a teenager graduates from high school, 15,000 hours will have been spent before the TV screen. Without a doubt, radio and television is invaluable as a source for providing information, but even without concern for the value of the radio and television material, the process of feeding people information defeats the affective process. From Dejene's (1979) point of view, the mass media in general, television and radio in particular, have become the major hindrances to independent thinking. Such thinking, he contends, was carried out through intensive reading.

Parents and children are watching increasingly more hours of television and listening to more hours of radio programming on a daily basis. Teachers find themselves in competition with these media, for while schools encourage reading and writing, the mass media discourage it. This is unfortunate because from Wagner's (1980) point of view, schools function on the premise that the bulk of learning takes place through reading, and much of what is learned there is based on the ability to read. (Wagner 1980)

Four possible causes of reading inadequacies have been cited: (1) the lack of parents' concern and involvement in early childhood, (2) children don't see the need to read, (3) insufficient use of sensory integration, and (4) radio and TV addiction. Though not an exhaustive list, it provides clues for pedagogical approaches and insights into remedial procedures.

REVIEW OF THE LITERATURE

To understand the role of industrial arts in reading improvement efforts in our school systems, it is necessary to first define industrial arts and examine some of the program offerings. Beginning with Charles Richards in 1904 and continuing through our present time new concepts have evolved and different ideas have been tried.

According to Herschbach (1976) in the 1870s and 1880s, industrial arts referred to a range of practical and scientific studies considered essential for running the new industrial-urban enterprise. Maley's (1973) definition is more encompassing

> Industrial arts, as a curriculum area, is defined as: those phases of general education which deal with technology—its evolution, utilization, and significance; with industry—its organization, materials, occupations, processes, and products; and with the problems and benefits resulting from the technological and industrial nature of society. (pp. 2–3)

It is not within the scope of this discussion to present every philosophy and concept of industrial arts, indeed that would probably result in confusion and not clarification of the role of industrial arts in the total educational system. Although this role may vary, in relation to a number of contributing influences such as administration, teaching staff, the community and society—there are certain basic goals that all programs seek to accomplish. These include, for the student:

1. An appreciation and understanding of our industrial/technological society.
2. The ability to work independently and in cooperation with others.
3. The development of problem-solving and creative abilities.
4. Experiences in the use of tools, scientific and technological equipment.
5. The development of career awareness.
6. Pride in craftsmanship and accomplishment.
7. Exploration and development of talents and interests.

In increasingly more situations, education has been taking on the broader dimension of cooperation and better interrelationships among the various disciplines and content areas. This welcome move has resulted from the recognition of a need for collaborative efforts; efforts upon which the production of a better educational product is predicated. Reading improvement is one area in which shared responsibility exists among the various teachers in the total school program. In the past there was the tendency to assign reading to the language arts classes or special classes conducted by a reading specialist. One weakness of this approach evidenced itself in the inability of students to broadly understand and interpret language. Grubaugh's and Molesworth's (1980) views are similar, they believe that students need to learn to manipulate the language from a variety of content areas. This includes being able to relate evaluative terms to concrete items, so as to understand the subject in depth.

Industrial arts offers outstanding opportunities for students to use, interpret, and manipulate language through a variety of reading activities in its programs. Published and unpublished reports, interviews and observations provide examples on the important role of industrial arts in the improvement of reading. These examples are cited in support of the position that the industrial program, in a very definite way, facilitates the improvement of reading.

For many youngsters, industrial arts is the area in which "things begin to happen for them." The very nature of the program, with its materials, equipment, and processes, produces an excitement and enthusiasm that may not be a reality in their other classes. It is this enthusiasm, combined with the process advocated for getting answers, that motivates the student to read. In such an environment the student learns how to learn, and for youngsters the thrill of discovery and the development of the ability to solve one's own problems is an experience that every youngster needs, and one to which children can relate.

Maley (1973) in an unpublished position paper, reported on an industrial arts and a vocational education class that he witnessed and how these programs facilitated the improvement of reading. At The Earle B. Wood Junior High School in Montgomery County, Maryland, he had the opportunity of listening to a "non-reader" present a five-page written report on the development of the Wright Brothers aircraft. The report was a part of the class requirement. To meet this requirement, the student had excellent support from the instructor and the school librarian in making sure that a good supply of multilevel reading material on the topical headings selected by the students was available for study. The written report was only one part of the assignment, the student was also required to prepare sketches to construct a model plane from the plans. Maley included in his report the central pedagogical ingredients of this incident. These were:

1. The student selected his own topic.
2. The topic was of interest to the student.
3. The student was encouraged to seek his answers from books and other sources and not to get them from the teacher.
4. A good supply of reference materials at all levels was available.
5. The act of reading and writing the report lead to something of vital importance to the student.
6. The student was rewarded for his reading efforts as well as for writing the report.
7. The report was actually read to the class by the student.

At an automotives laboratory in a vocational program on the lower Eastern Shore of Maryland, reading was an integral part of the program. The up-to-date automotive manuals showed evidence of extensive use. Students were required to read diligently and accurately in order to find the required information relating to fits, tolerances, adjustments, parts replacement and installation. Many of these students were also "non-readers."

The New York Times featured an article by Kane (1975) in which he described something very special and unique that was happening in the New York City schools. Herbert Siegel, Director of Industrial Arts Bureau, developed a Publishing Activity Program because of his conviction that industrial arts could contribute to pupil motivation to read as well as the improvement of reading and writing and comprehension skills. Kane reported that in New York City, elementary school pupils in over 200 schools write, compose, and print their own school magazines, which have a wide circulation within their communities. In what are called publishing activity centers, fourth, fifth, and sixth graders learn writing, proof reading, layout art work and printing. The students get their fingers blackened with printer's ink while learning about the careers in the publishing business, and learn the excitement of reading while doing it.

At one school in which the program was in operation 1972–73, there were notable results in reading improvement. Seventy-four pupils in P.S. 35 from grades 3, 4, and 5 showed an average year's growth of 1.1 years. Of even greater significance is the fact that these children were all experiencing retardation in reading and had never before achieved a year's growth for a year in school.

At the International Conference of the American Industrial Arts Association, Baillargeon, Siegel and Surra (1979) presented further evidence of the contribution of Industrial Arts program to reading improvement. They reported that:

> A formal research study (1974–78), conducted by the New York State Education Department, entitled "The Effects of Industrial Arts Publishing Activity Center on Reading Achievement Scores," clearly indicated in the results of the analysis that: each Publishing Activities Center studied had a strong statistically significant association with an increased rate of reading achievement gain during its *second* and *fourth* year of operation for *all* students."
>
> Six elementary schools with new units installed in the fall of 1974 were asked to maintain a student-by-student record of time spent in the PAC. At the end of the year individual student records on standardized reading tests were compared with time spent in

> the centers. Variables introduced were the grade levels, the mobility of the students, gender, ethnicity, bilingualism, and reading program changes in the schools during the year. A total of 1558 students have been included in the four year testing period. First year effects were neutral but the second year of operation showed startling gains. After a one year hiatus data was collected for the third time and this substantiated the gain shown in the second year. The conclusion is that student individual test scores increased proportionately to the contact hours spent in the Publishing Activity Centers.

At the St. Louis American Industrial Arts Association conference, Walencik and Wisnovsky (1980) reported on a 1978 research project undertaken in a basic drafting class. Using appropriate research techniques, fifty-six students enrolled in basic drafting were divided into two groups. The experimental group was provided a reading enriched basic drafting curriculum, whereas the control group followed the traditional program for a basic drafting class. At the end of four weeks the experimental group improved their comprehension, vocabulary, sequencing and spelling skills. Analysis of the pre-test/post-test scores indicated an improvement rate of 20.714 in the experimental group and a 2.536 in the control group.

During his four years of teaching industrial arts at Mount Carmel Junior High School in Edmonton, Alberta, Canada, this writer had the opportunity of witnessing the influence of industrial arts on the improvement of reading. The industrial arts program at this school, as all other such programs in Edmonton, was conducted in multiple activity laboratories. The program was so structured so that the teacher was, in effect, the manager of a learning laboratory. It was a laboratory in which reading was requisite to the satisfactory completion of a project. For example, if a student had a wood project that required finishing, he or she had to identify possible finishing procedures and justify the final choice based on the intended use of the project. This required reading, even though it may have been information from containers or wall charts or trade publications. The reading, though required, was not forced. Students were motivated to read in order to find information and solve problems because there was abundant evidence of the rewards and self-fulfillment realized by other students.

This writer well remembers Andrew, who in 1977 wanted to make a working model of an ancient water wheel, a device used by his foreparents in China. This was a project at which the instructor had no experience or expertise. A contract was drawn up with the student. The contract stipulated that Andrew, as all other students under contract, had to develop a complete information and instructional packet that was adequate enough to facilitate the duplication of the model, without further assistance. The contract option, which requires a significant amount of reading, was a favorite of the grade nine students.

Contemporary industrial arts programs emphasize creativity, discovery, research, experimentation and development. This is, in fact, an instructional method that helps the student recognize the value of reading, and inspires a new dimension in their educational experience. Braun (1971) noted that educators are becoming increasingly aware that the magic key to success in reading may be some extra component that energizes the young reader to want to read—some stimulant that inveigles him to discover new generalizations in real life situations.

THE CONTRIBUTIONS OF INDUSTRIAL ARTS

The role of industrial arts in modern school systems is not fully understood and appreciated in every section of society. In some people's minds, industrial arts is narrowly conceived as an opportunity for boys to get out of regular academic classes and do something with their hands. While it may be sometimes difficult to refute this concept, the fact is industrial arts has been and continues to be supportive of academic subjects and plays a major role in the development of basic skills. These basic skills include communicating, problem solving, body coordination and reading.

It is the opinion of many that reading belongs exclusively in the reading classroom with a reading specialist in charge. The literature does not support this position; it is replete with examples of successes in reading improvement through the content areas. Black and Harding (1981) observed that because reading skills differ from content area to content area, the teaching of these skills should not be isolated from the classroom. The subject area teacher is in the best position for teaching these specific skills while using the content for which they are intended.

In every aspect of life the ability to read and communicate is requisite. Were this reading ability simply an information-gathering skill, it would have already been abandoned for more efficient methods. The nonprint media such as television, radio, tapes, and discs have been a more lucrative source of information. To better appreciate the need for reading ability one might consider this definition of reading by Gates (1949)

> Reading is not a simple mechanical skill; nor is it a narrow scholastic tool. Properly cultivated, it is essentially a thought process. However, to say that reading is a thought-getting process is to give it too restricted a definition. It should be developed as a complex organization of patterns of higher mental processes. It can and should embrace all types of thinking—evaluating, judging, imagining, reasoning, and problem solving. Indeed it is believed that reading is one of the best media for cultivating many techniques of thinking and imagining. (p. 3)

This definition is consistent with the goals for industrial arts in the twentieth century. It will be necessary to keep both this definition and the definition of industrial arts in focus to appreciate the role industrial arts can play in the improvement of reading. While it may not be practical to incorporate all the ideas advanced in every laboratory, the industrial arts programs are sufficiently dynamic and diversified as to give credence to the concept.

In the modern society the average citizen is forced to relate to a highly technological society. Reading material is becoming more complex. Increasingly more of the printed material is filled with the language of the new technology. For those whose lives are void of technology related experiences, dealing with the print media has become a problem. Reading experiences in the technology related program of industrial arts could well be a solution to this problem.

Students are generally reward oriented; because of this orientation they seek a purpose or a goal for most of their school activities. In industrial arts, the motivation to read is there, in part because of the relevance of the reading material to the classroom activities; and in part because of the modern technologies and materials to which students can correlate their reading.

Like the program, the reading materials related to the subject area of industrial arts are diversified and move easily from the simple to the complex. A student is therefore able to find reading material in his or her field of interest and at the appropriate level of difficulty.

Combinations of letters take on different meanings, depending upon the context in which they are used. The more varied the application of word usage the student is exposed to, the better he or she is able to manipulate the language. To cite just a few examples, the word negative in common parlance means "no." However, in photographic technology the meaning is entirely different. Similarly, the word "finish" has a meaning in everyday usage and another meaning in wood technology applications; or compare "developer" as used in connection with real estate with its application in photographic technology.

The language used in the industrial arts laboratory is to a large extent unlike the language of other subject matter areas. This is so because of this subject area's association with tools, equipment, materials, processes, and procedures related to industry, business and technology. A whole new vocabulary could be developed through the industrial arts experience.

Trade journals and popular magazines are generally very appealing because of their color, pictures, and brevity of presentation. The articles in these publications are usually up-to-date and sometimes futuristic in nature. Industrial arts teachers are, with good response, able to refer students to selected articles for extra reading.

Science and technology will greatly affect the present and future school populations. This effect may be extensive enough to influence their ability to make a meaningful contribution to society. Industrial arts affords students the opportunity to study modern industry and technology through a variety of learning processes.

Immediately upon entering the industrial arts laboratory and casually looking around, the student is confronted with an abundance of reading materials in the form of wall charts, posters, slogans, and signs. Other non-book reading material includes information on containers, packages, equipment, procedure and information sheets. For the student who avoids books, this reading material is beneficial in terms of his or her development. This can also provide an incentive for further reading.

The potential for practical application of information gleaned in the reading material provides an incentive to read. Invariably the application is made within the framework of the student's own experience. This is a further motivating factor.

Problem-solving constitutes a major part of the industrial arts program. Reading is fundamental to problem-solving. The industrial arts teachers include reading development as an integral part of their program.

As one subject matter area in the education program, industrial arts accepts the responsibility of keeping its pupils abreast of industrial and technological developments. Such exposure cannot be adequately accomplished through the teacher's lectures and demonstrations. The teacher's role is to help acquaint the student with sources for exploring the new technology. A reliable and readily available source has been the print media.

Students quite rightly associate education with their futures, and industrial arts is future oriented. As a subject area, children find it not only interesting but a form of education to which they can easily relate. This provides a good incentive for reading.

Each subject area, and particularly industrial arts, has a vocabulary that is unique to it. In this subject area there is good potential for increasing one's vocabulary and improving language skills.

Provision is also made in the industrial arts program for researching topics of interest and writing reports. Students take pride in preparing and presenting good reports.

Critical reading is a skill required when dealing with technical information. Students develop this skill as they evaluate, verify the authenticity, judge and interpret the reading material they encounter throughout their industrial arts courses and their construction activities.

Oral reports on selected topics have been typical class assignments in industrial arts that require study and preparation by the student. Visualize, if you will, the situation in which a student is required to present an oral report on "The Future of Printing." This is another excellent opportunity for reading in the industrial arts program that could lead to a printed project dealing with the topic.

SUMMARY

There is a good possibility that the student who leaves school without adequate reading skills is a candidate for failure. Such students seldom accomplish to the maximum of their potential. Children are, by law, compelled to go to school. The school has a responsibility, therefore, to prepare these children for survival and fulfillment in a very complex society. As part of the total program of education, industrial arts has a significant role to play. The effectiveness with which this role is played is determined by the nature of the industrial arts experience and how well the teacher is able to take advantage of the student's need to know words to accomplish tasks or projects of interest to the student. The need to know coupled with a genuine interest in what one is doing provides a powerful tool in the educator's effort to stimulate reading in most students. Industrial arts provides the setting and the form of involvement that enhances reading as a tool to be used in meeting the student's need for accomplishment with the tools, materials, and processes of industry.

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Chapter 10

Industrial Arts and Its Contribution in Assisting the Student in Language Arts Development

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THE ISSUE

Industrial arts is the phase of general education that concentrates on a study of industry and technology. It assists all youngsters in the development of capabilities to meet their basic needs for living in an industrial/technological society. Learners are actively involved in the broad content areas of communications, production, and energy and transportation.

The language arts assists the student in the development of basic listening, speaking, reading, and writing skills. Auxiliary language skills are also developed in visualizing, thinking, and locating information.

Industrial arts can make a major contribution to the development of the language arts. Learners participating in industrial arts activities can

—receive instruction in a way that complements the language arts continuum.

- study the evolution of language development and related technology.
- receive and express the language of industry.
- conceptualize personal experiences with tools, materials, and industrial processes.
- express associated emotions, interests, and beliefs.
- experience a broad range of nonverbal and verbal teaching methods.
- study numerous print and nonprint curriculum materials.
- interact frequently with peers, teachers, and consultants in various educational and industrial settings.
- communicate with humans and machines in realistic and purposeful situations.
- apply a technical symbol system.
- study a systematic process of generating, encoding, transmitting, receiving, decoding, storing, and retrieving language.
- produce and apply communications technology.
- plan, produce, and service various industrial products and apparatus.
- apply general principles of science and technology.
- access needed information in various school and community resources.
- apply the "scientific method" of solving problems.
- follow the guidance of professional industrial arts teachers who possess language development skills.

This discussion will deal with the problems, issues, and concerns that are pertinent to language arts development. It will identify the linkage between the language arts and industrial arts. The role that industrial arts can play in developing the language arts will be the final section of this discussion.

CHARACTERISTICS OF THE ISSUE

Language is a system of organized symbols that represent concrete objects, ideas, emotions, and relationships. These symbols are consciously used by humans to communicate in an oral and written manner. Petty and Jensen (1980) define language as

> the fundamental means by which humans communicate ideas and emotions. It is a vital part of every human activity. Universally humans talk, and almost invariably they utilize some form of recorded or written expression. (pp. 23-24)

Purpose of Language in School

The most unique and developed characteristic of humans, and perhaps the most important subject in school, is language. It is both a separate subject and a vehicle for learning most other subjects including industrial arts.

Brossell (1977) has described this dual role of language as language education and language learning. Language education employs language as a means for achieving the desires and results of the learner; whereas, language learning uses language as a tool for personal and social growth.

Language serves as a means for communicating, thinking, transmitting culture, and releasing tensions or reacting to personal incidents. People use language to display creativity, express feelings, and share thoughts with one another (Britton, 1977; Petty & Jensen, 1980).

Language has both functional and appreciative value. The skills of language usage are functional when the student needs to identify facts, comprehend meaning, follow directions, and apply information. Appreciation is exhibited when language elicits pleasure or enjoyment, such as through the speech of an articulate speaker, the rhythm of poetry, or the emotional involvement of a dramatic play.

The school also has the responsibility of teaching the appropriateness of language for various social settings and purposes. Students need to develop accurate grammatical structure, know the differences between standard English and slang, use the social amenities, and understand the technical vocabularies for the various subject areas. Students should be able to choose and apply the language most appropriate for the intended audiences.

The Communication Process

Muth (1980) has defined and recognized the importance of communication for humans.

> Communication—the successful transmission of information across time and place, among humans and other life forms—has assumed vital proportions in industrialized nations. Beyond perhaps all other factors, communication has become the central bond that distinguishes "developed" societies from "undeveloped" ones. (p. 2)

There are various related stages in the communication process. According to Forrester (1979), Claude Shannon developed a model to describe the communication process as a result of studying telecommunication systems in 1947. Shannon identified the person who was attempting to send the message as the transmitter, the selector of the appropriate signs for the message as the encoder, the method of sending the message as the channel, and the receiver of the

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message as the destination. Any interference or barrier to effective transmission was noise.

Hauenstein and Bachmeyer (1975) defined the communication process as sending and receiving information. Thinking of the message was known as encoding. Sending the message via speaking, writing, drawing, gesturing, or touching was transmitting. Accepting the message and recognizing its symbols was receiving. Understanding the message through one's senses was decoding. Upon receiving the information, the receiver could encode and transmit a response to the original sender.

Language Development in Humans

The development of language in humans is basically the same throughout the world. Jordan (1973) noted virtually the same process in more than thirty cultures. In each culture, the onset of communication is the crying associated with discomfort that normally occurs at birth. Cooing then occurs during the first three months to reveal comfort as the baby watches, feels, and listens to the surroundings. Next comes the babbling or preverbal vocalization period in which the child makes sounds of self-satisfaction. In about six months, the child starts to imitate the physical and vocal characteristics of the parents (Diack, 1966; Pushaw, 1969).

Children must be exposed to language for the normal development of language. The imitation of sounds results in the child's first word, usually during the second six months of life. Syllable and word development is most rapid during the first year. Initial words are names for objects, wants, and demands, along with definitions of the environment (Petty & Jensen, 1980). Intonation is developed to give meaning to the words. Two-word sequences provide concern for word order as additional word combinations call attention to the rules of grammar. By age thirty months, the child possesses 70% of the total adult phonemes. At age six years, the child has learned the entire phonology of the native language. However, it takes years to develop correct grammar and the remainder of the person's life to develop the numerous levels of meaning (Carroll, 1978; Jordan, 1973).

Two theories exist to describe the development of language. According to Petty and Jensen (1980), the empiricists suggest that "language is learned through experience" (p. 57). The nativists believe that the "acquisition of knowledge is a biological tendency that is activated by experience" (p. 58). Both theories identify experience as the key to language development.

The common concern for experience provides valuable implications for education. Piaget (Ginsburg & Opper, 1969) theorized that concrete activities provide the major source of learning for each child.

> The child must begin by acting on objects, that is, by manipulating them. Over a period of time, these overt, sensorimotor schemes can become internalized in the form of thought. Still later the child may be able to express on a verbal level the notions he has developed on the basis of interaction with the world. (p. 221)

Understanding consists of various levels of experience. The higher levels of intuitive and verbal understanding depend on active involvement at the lowest level of motoric (Campus, 1979). Regardless of the person's age, concrete experiences need to have preceded verbal explanation and written materials to develop true knowledge. After there has been active involvement with an object or situation, language can then be used to internalize the experience.

The development of word meaning can be used to illustrate the language development continuum. Each word added to a child's vocabulary may have three distinct levels of understanding (Anne Arundel County Public Schools, 1979). At the specific understanding level, only a single definition, event, or object is associated with the term. The next higher level is functional understanding in which the term can be used in a sentence to demonstrate greater understanding. During the highest level, the conceptual level, several meanings are associated with the same term.

Evolution of Human Language and Related Technology

There are four major forms of language including sign, picture, verbal (spoken), and written. Primitive humans probably used natural responses of cries, gestures, and facial expressions to signify their intentions and emotions. Memory aids, such as cairns, stick markers, and tree rubbings, assisted communication. As the natural signs and vocal sounds were used, they became refined in meaning so that human communication became simpler.

Eventually, graphic symbols (pictographs) were used to represent natural signs. Early pictographs represented concrete objects and were rather detailed. Through use, these renderings became simplified.

The alphabet that is used in Western civilization was first developed by the Phoenicians. This alphabet was a symbolic version of pictographs for which phonetic sounds were associated. The Greeks refined the alphabet and developed consonants and vowels. Later, the Romans further refined the Greek version to basically provide the alphabet of today. Minor modifications have been made by the Anglo-Saxons.

Concurrent with producing an alphabet was the development of lettering materials and tools, including ink, parchment, papyrus, paper, and pens. The scribes laboriously produced manuscripts by calligraphic lettering. A need for mass production of graphic materials soon led to printing. Developments in type progressed from wood blocks to hand-set movable type, to mechanically set type, and then to the photographic, electronic, and laser typesetting of today.

Developments in visual, audio, and audiovisual technology have had a greater impact on civilization than any other type of technology. These advances have been exemplified in the visual media of newspapers, books, photographs, and signs; audio media of records, tapes, telephones, and radios; and the audiovisual media of television, motion pictures, and theater.

White (1980) has postulated that advances in electronics and applications of the computer have created a social transformation from the "industrial era" to the "communications era." The traditional ways of gathering, storing, accessing, and transmitting information primarily on paper may be largely replaced by a revolution of electronic technology.

Language Arts

The language arts consists of listening, speaking, reading, and writing. These language skills are developed along the respective continuum. Difficulties at any level may cause language problems at higher levels (Burrows, undated).

Listening is the process of perceiving sounds, discriminating among them, and interpreting their meaning. It is the means of receiving oral/mechanical language that consists of hearing, understanding, evaluating, and responding to messages.

Specific skills should be taught that require listening for details, for the main idea, to follow directions, to distinguish the relevant from the irrelevant, and to draw inferences. One should be able to comprehend word meanings, identify moods, and judge persuasion (Petty & Jensen, 1980).

Speaking is the process of uttering ideas, information, and feelings to reveal one's interpretation. It is the means of expressing oral language. In an instructional context, the learner's speech is refined and extended to different social situations through free talk, conversation, discussion, dramatization, and oral reading.

Specific skills should be taught that require speaking in seeking information, giving directions, providing explanations, giving information, expressing feelings, persuading others, making requests, complying with social amenities, and providing pleasure. The learner should be able to choose content that is appropriate for intended listeners; vary structure to accommodate the purpose, audience, and situation; use the form of language appropriate for the occasion, content, and audience; organize ideas and information; and support ideas with accurate facts and valid sources (Petty, Petty, Newman, & Skeen, 1977).

Reading is the process of comprehending the meaning of written and printed signs and characters. It is the means of receiving written language. For instructional purposes, reading consists of perceiving, decoding, interpreting, and retaining written information and feelings.

Specific skills should be taught that require reading to follow directions, determine main ideas, select important details, distinguish between fact and opinion, perceive relationships and summarize passages; locate information in a single resource, a multi-volume resource, and a multi-resource center; attain satisfaction, pleasure, and personal growth; elicit information for personal, educational, vocational, societal, and domestic purposes; and interpret forms for reporting personal information and financial agreements (Cramer, 1978; Maryland State Department of Education, 1975–76; Petty & Jensen, 1980; Petty et al., 1977).

Writing is the process of communicating ideas, information, and feelings on the surface of various substrates. It is a means of graphically expressing language. In an instructional context, writing

> is a conscious process of selecting, combining, arranging, and developing ideas in effective sentences and paragraphs for a variety of purposes, which serve both public and personal needs. (Maryland State Department of Education, 1980, p. 1)

Specific skills should be taught that require the learner to identify the purpose for writing; organize thoughts; apply accepted spelling, penmanship, punctuation, and capitalization; observe conventions of written forms; select appropriate language for the audience and situations; and review the written manuscript. Learners need to record information; write messages, letters and reports; complete forms; and write sentences and meaningful paragraphs (Ackerman, Baygell, & Fishel, 1979; Maryland State Department of Education, 1980).

Other skills are commonly associated with the language arts. These skills include thinking, visualizing, and locating information.

Thinking is the process of examining concrete and abstract language symbols to create concepts, clarity, and meaning. It is the intellectual processing of oral and graphic language. Only when a person is motivated to think will the other language arts be attained. Each learner should reason, make decisions, form opinions, draw conclusions, and conceive new meanings and principles.

Visualizing is the process of forming mental images or pictures. A concern for greater visual literacy has been manifested in communications technology or the nonprint media. Ruth (1977) has proposed that educational settings be the environment "for the *interpretation* of information, for the *examination* of thoughts and feelings stimulated by information, for *expression* and *creation* of students' own versions of reality through various media" (p. 105).

Locating information is the process of accessing material and human resources. It includes knowing where to locate the resources as well as how to obtain information from them. These resources include dictionaries, indexes, encyclopedias, directories, atlases, nonprint media, computers, and consultants.

REVIEW OF THE LITERATURE

Wilber and Pendered (1973) have described a major similarity of industrial arts and the language arts.

> Industrial arts is an area of the curriculum in the public schools beginning in the kindergarten, continuing through all grades, and terminating in programs of adult education. In this respect, industrial arts is comparable to the language arts in our schools. (p. 39)

Human Language Development

Both the language arts and industrial arts should be thought of as processes to assist language growth in humans (Cochran, 1970). Language is not only learned in the language arts but in industrial arts. Petty and Jensen (1980) indicated that "it is in those other subjects that the real motivation for language mastery develops. Language skills become habitual through use in all school activities" (p. 111).

Thinking of language as a process of human development infers a holistic approach to developing language abilities. Language learning at all stages of development can be improved by continuous reading with increasing difficulty and variety, numerous talking experiences, linking writing to other language activities, and participation in realistic language usage situations (Britton, 1977).

Sound process-oriented teaching also requires specific developmental sequences for language. During the early elementary years, students are usually free in providing verbal response. A logical language sequence would be for students to manipulate concrete objects, listen to an oral presentation, and then respond orally, in play, or dramatically. In the later elementary years, reading and writing are being learned. Concrete experiences, exploratory talk, reading and writing, and then further talking and listening are necessary to assist and advance the language processes. During the junior high and senior high school years, thought becomes more abstract and language more representational. Topics should be researched, discussed, applied, analyzed, and reported in written and oral forms.

Industrial arts can assist individuals in making occupational choices and being effective in selected occupations. Maley (1979–1980) has indicated that the development of one's fundamental skills in reading, writing, communicating, problem-solving, and inquiring is essential to occupational success. Industrial arts has the greatest potential in terms of content and the variety of experiential activities to develop these basic language skills.

Concrete Personal Experiences

A child's direct experiences with concrete objects including people, food, clothing, toys, and other aspects of the environment provide the basis for language development. These various personal experiences are received through the child's senses to stimulate thinking and the use of language (Miller & Boyd, 1970; Scobey, 1968; Swierkos & Morse, 1973).

The manipulation of objects is essential for higher verbal understanding. For words to have meaning to a child, they must be associated with first-hand experiences (Britton, 1977; Diack, 1966; Ginsburg & Opper, 1969). Based on this fact, Wilber and Pendered (1973) have emphasized that

> first-hand experiences with tools, materials, industrial concepts, and processes constitute an important element in the common learnings of all elementary pupils from kindergarten through grade six. (p. 39)

Language—The Vehicle of Understanding Industrial Arts

As an experience is received through one's senses, a mental image called a concept is formed. As a concept is created in one's mind, symbols are associated with the whole concept and its parts. These symbols constitute language that can be thought about to make the experiences meaningful. Students interpret the meaning of their experiences when given the opportunity to express them (Woodruff, 1961).

Language consists of listening, speaking, reading, and writing vocabularies. A major function of education is to promote the growth of each vocabulary. The best way to expand each is to provide numerous new and exciting concrete and verbal experiences.

As one becomes involved in various levels of industrial arts experience, understanding becomes greater. In other words, each experience takes on additional meaning as one comprehends, applies, analyzes, synthesizes, and evaluates the experience.

Vocabulary in industrial arts needs to be defined daily and discussed to aid reading and learning. The necessary technical vocabulary must be directly taught. Students must continually use this vocabulary to increase their level of understanding (Anne Arundel County Public Schools, 1979).

Because the number of concepts is infinite, it is important that industrial arts students have the working knowledge to locate and determine their meaning. John Dewey criticized verbal learning only for recall as producing minimal understanding and of little value. He suggested that higher understanding came about through realistic personal experiences, a systematic coverage of a well-planned curriculum, and attention to higher levels of thinking. His ideas gave birth to the Progressive Education Movement, which emphasizes realistic activity, the learner, and the need to improve life.

Language is also the means to understanding one's feelings and beliefs. Lodge (1977) has indicated that teaching strategies should "force students to think about their values, to make choices, to examine their decisions, to reveal themselves to themselves" (p. 139).

Language Learning Methods

Language skills are learned by practicing them. The most efficient strategy incorporates the following guidelines: A felt need should be exhibited for the skill; the objectives or purposes for learning are overtly expressed; reinforcement and feedback are continually provided; learners are actively involved in activities appropriate for the desired level of understanding; and the results of the learning are evaluated by the students.

The level of language development is important in determining industrial arts teaching methods. First, consideration should be given to the language arts continuum. For example, effective reading and writing depend on effective listening and speaking experiences. Second, consideration should be given to the levels of cognitive understanding. If identification or labeling is the objective, then methods such as lecture, show and tell, and drill are appropriate. For comprehension, the discussion, demonstration, and inquiry methods are effective. If application is the objective, then the project, problem solving, and role playing are useful.

Social Experiences

Social interaction in the industrial arts setting promotes an exchange of facts, principles, and opinions, which assists verbal understanding. This direct experience with verbal interaction permits one to discover the effects of language on others and oneself.

Language differs with the purpose and social setting. To be effective speakers and writers, students should be able to identify audiences, classify purposes, recognize the appropriate language, and practice in varied and authentic social situations.

Real Life Need

Effective speakers and writers need effective listeners and readers, respectively. Petty and Jensen (1980) remarked that "an attentive, interested audience or an interested reader motivates the child to make his or her expression as effective as possible" (p. 99).

Realistic and purposeful communication situations stimulate language development. In student-centered classrooms, students plan, discuss, confer, role-play, report, announce, demonstrate, analyze, and evaluate to satisfy their communication needs.

Vocabulary growth occurs most rapidly during genuine communicative activities. The new term or meaning is retained when related to previous knowledge and then applied in the learning setting.

Learners need to be challenged and then guided in developing language skills. Petty et al. (1977) expressed how this can be accomplished.

> At every educational level—elementary, secondary, and beyond—students must be surrounded with experiences that lead to questions, must be helped to find answers, and then be encouraged to talk about these answers, weigh them, even question them. (p. 92)

Language Resources

The key to successful language and industrial arts instruction is the teacher. A teacher who is knowledgeable about language learning will organize industrial arts instruction to assist understanding of the concepts and their relationships. Realistic but positive expectations are revealed to each learner. An enthusiastic industrial arts teacher stimulates the students to be actively involved in applying and questioning the meaning of the content. In addition, continued feedback and reinforcement is given to each learner's ideas, feelings, and achievements.

An effective program requires concrete and verbal experiences with a multitude of instructional materials (Giachino & Gallington, 1977). Various print, audiovisual, and multisensory materials should be available and used in the instructional program. Consideration should be given to program objectives, listening/reading comprehension levels, relevancy to student interests and needs, organization of content, opportunities for evaluation, and fairness to all people.

CONTRIBUTIONS OF INDUSTRIAL ARTS TO DEVELOPING THE LANGUAGE ARTS

Both the content and methodology of industrial arts contribute to language arts development. This section contains a discussion of the role of industrial arts in language development, cognitive development, and elementary education. It also has a description of the content of communications technology methods of teaching industrial arts, and instructional resources for industrial arts.

Learner Language Development in Industrial Arts

The human development of language in industrial arts is improved most in the childhood and adolescence stages of maturation through student interaction. Students communicate, comprehend, and interact with language by using language. They learn by doing and by discovering the effects of language on others and themselves.

During the early childhood stage, learners need to improve their application of the symbol system. In industrial arts, students learn new technical terms, discuss projects, illustrate ideas and objects, give and take directions in planning and producing products, and interact with the teacher and peers.

In late childhood, leadership and communication skills need to be developed. Children communicate during project planning and progress seminars; construction, manufacturing, or servicing of a product; and descriptions of the industrial arts activities in final reports.

Early adolescence is a time of abstract thinking and applying general principles along with the further development of language and communication. Youth in industrial arts are given the opportunity to define, describe, discuss, explain, analyze, and evaluate the first-hand experiences of the classroom and laboratory. Also, they relate verbally to various inventions, developments, occupations, problems, and benefits of industry and technology (Charles and St. Mary's County Public Schools, 1979; Maryland State Department of Education, 1979).

Industrial Arts and Cognitive Development

According to Wilber and Pendered (1973), industrial arts can make a major contribution to a learner's critical thinking ability. They stated: "The development of the ability to think can well be regarded as the central purpose of industrial arts education" (p. 26).

In the complex industrial/technological society, it is more important to identify possible answers and make intelligent decisions than to possess a vast storehouse of knowledge. Industrial arts strategies prepare learners in developing language skills to locate information and ideas that can be creatively implemented in the content areas of manufacturing, construction, communication, and energy.

Students develop their ability to think in industrial arts through solving problems relevant to the tools, materials, and processes of industry. The scientific method of problem solving is often taught in the planning and production of a project.

The project method involves language arts skills in enhancing the cognitive development of the learners. Posed with a problem, the student in industrial arts will seek potential solutions through reviewing print and nonprint media, observing demonstrations, thinking about previous experiences and consulting with the teacher, peers, and relevant others. A project plan is developed in terms of concrete materials as a solution to the problem. The plan often includes sketches and mechanical drawings, an equipment and materials list, and a step-by-step procedure. As the plan is followed, the student communicates, experiments, manipulates, constructs, and manufactures. Upon completion, the effectiveness of the project in solving the problem and the resultant learning are evaluated. With each successful experience, increasingly complex projects can be pursued.

The instructional sequence in industrial arts is devised to complement the language arts continuum of listening to writing and assist the development of cognitive understanding. A typical sequence would involve the students in observing and listening to the teacher who is giving a demonstration. Concrete experiences are provided as the teacher uses various tools, equipment, and materials to show and explain the process. The student's understanding is checked by selective involvement in performing parts of the demonstration and in a question/answer discussion.

After the teacher presentation, students may read the textbook and other references. A project is carefully planned in writing and drawing to apply the ideas, concepts, and principles previously comprehended. The planning and production of the project also incorporates analysis and synthesis. Accompanying the project are often discussions, conferences, seminars, instruction sheets, and evaluation checks to clarify concepts and improve the results. A final written (and perhaps oral) report may conclude the experience.

The language skills used provide conceptual understanding of what was done. For example, writing provides the learners with the opportunity to better understand the experience and themselves. It permits the students to think about and synthesize the experiences of the laboratory. In addition, questioning assists cognitive development. Along with improving vocabulary skills and word-relationship skills, increasingly complex questioning can guide the students into the higher levels of understanding.

Industrial Arts in Elementary Education

In elementary education, industrial arts activities assist the language arts in providing first-hand experiences, motivation, an understanding of how language developed, and the content for learning about industry and technology. Industrial arts has been both a method of instruction as well as a content area.

The tools, materials, and processes of industry provide concrete experiences and stimulate elementary school children to learn the language arts. Numerous communicative skills are developed while constructing models, apparatus, and instructional aids and in their application during a dynamic study of the various disciplines.

Elementary pupils apply the language arts in learning a technical vocabulary. They learn to design and draw project plans, write and follow directions, write letters of invitation and appreciation, listen to and question peers and consultants, record data of experiments, direct others, and present reports.

Communications as Industrial Arts Content

Communications technology includes the devices, materials, and processes necessary for communicating messages. Practical experiences are gained in encoding, transmitting, receiving, decoding, storing, and retrieving information, ideas, and attitudes. In addition, the occupations, problems, and benefits of the communications industry are explored.

A study of the evolution of communications technology assists in a historical and social understanding of language development. Written language development involves a study of the alphabet, lettering tools, and materials, typography, image carriers, and the various graphic reproduction processes. Oral language development includes a study of phonetics, audio generation, and audio recording.

Contemporary courses that represent a study of communications technology are technical sketching, engineering graphics, drafting and design, graphic arts, graphic communications, photography, visual communications, and industrial communications. Typical language-related activities include layout and design, type composing, proofreading, illustrating, photography, recording, editing, printing, finishing, binding, packaging, and marketing.

Methods of Teaching Industrial Arts

Students learn to listen, speak, read, write, think, visualize, and locate information relevant to industry and technology by actively participating in industrial arts activities. These activities are organized as teaching methods and strategies.

In a national study (Maley, 1978), selected methods of teaching were ranked according to their application in contemporary industrial arts programs. The methods, in decreasing order of use, were demonstration, class discussion, problem solving, discovery, inquiry, project, simulation, motion pictures, conference, instruction sheets, role playing, lecture, other educational technology, show and tell, seminar, field trip, on the job or on site, television, programmed instruction, case study, and contract. These methods were applied in the unit, group project, line production, and research and experimentation strategies for organizing industrial arts instruction.

Instructional Resources for Industrial Arts

Industrial arts is rich in resources to develop the language arts. These resources include the laboratory facilities, peer groups, certified teachers, professionally developed curriculum materials, and school and community personnel and materials.

The laboratory facilities include the tools, equipment, and supplies that provide concrete experiences. These items provide the bases for the various language arts skills to be developed.

The peer group provides both the participants and an audience for purposeful industrial arts activities. It engages in conversations, discussions, conferences, role playing, seminars, and student organization meetings.

Teachers of industrial arts have expertise in industrial/technical content, learning theory, instructional design, methods of teaching, laboratory organization and management, as well as tests and measurements. These individuals have the backgrounds to be effective models of language usage.

Professionally developed curriculum materials are abundant for industrial arts. Resource materials such as textbooks, study guides, laboratory manuals, instruction sheets, transparencies, professional magazines, and audiovisual media are prepared by people with strong backgrounds in learning pedagogy.

Students in industrial arts have vast opportunities to go beyond the classroom and laboratories. They are encouraged and need to interact with other school resources such as librarians, media specialists, drama coaches, language arts teachers, and other support personnel. In the community, they interview business, industrial, and government consultants; perform research in museums, technical libraries, and information centers; and correspond with professional and research organizations.

A CONCLUSION—TYPICAL INDUSTRIAL ARTS ACTIVITIES

A conclusion to the role of industrial arts in language arts development is the listing of typical industrial arts activities. This list has been organized under such headings as general industrial arts, communications technology, and language arts program support activities.

General Industrial Arts Activities

Students who are given a genuine opportunity to participate in industrial arts activities can

—verbalize about the abundant sensory experiences.
—comprehend the technical vocabulary.
—give and follow directions for constructing, manufacturing, communicating, transporting, servicing, etc.
—listen to teachers, peers, consultants, and audio media.
—speak in announcing, conversing, discussing, demonstrating, role playing, greeting, and reporting.
—read the textbook, technical manuals, catalogs, instruction sheets, drawings, labels, and posters.
—write technical letters, forms, memos, reports, and resumés.
—visualize drawings, artwork, and photographs.
—locate information through letter writing, telephoning, personal interviews, media investigations, and computer searches.
—interact with peers, teachers, and consultants.
—plan industrial products and services by researching, designing, identifying materials, developing a procedure, and evaluating.
—letter drawings, charts, graphs, schematics, and other graphic representations.
—record notes on class presentations.
—interact in seminars, conferences, field trips, and social events.
—participate in class question-answer sessions.
—decode scrambled letters in word games.
—dramatize safety rules and discuss the reasons for them.
—role-play careers and occupations in the personnel organization of group project and mass production industries.
—advertise and market mass-produced products.
—express feelings and emotions relative to events in the laboratory.
—produce bulletin board displays, models, and dioramas.
—report research and experimentation activities.
—follow parliamentary procedure in club meetings.

- —report the minutes of class and club meetings.
- —evaluate language skills through observation and examination of self.

Communications Technology Activities

Students who are enrolled in communications technology courses should be able to

- —identify examples of the components in a communications model.
- —trace the technical evolution of language development.
- —study sizes, styles, legibility, readability, and appropriateness of type.
- —apply design guidelines for communicating messages.
- —compose, edit, and proof type for graphic reproduction.
- —research, plan, produce, apply, and report on communications technology.

Language Arts Program Support Activities

Industrial arts complements language arts programs at the elementary and secondary levels by allowing the students to

- —produce puppets, marionettes, scenery, and properties for plays or skits.
- —participate in the production of school newspapers, yearbooks, sports schedules, play programs, stage scenery, and other language-related apparatus.

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Chapter 11

Industrial Arts and Its Contribution to Economic Education

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THE ISSUE

Industrial arts has had and continues to have a major contribution to make in the area of economic education. As a vital part of American education, industrial arts is defined as a comprehensive educational program concerned with *technology*, its evolution and significance; with *industry*, its organization, personnel, systems, techniques, resources, and products; and with the social/cultural impact of both technology and industry.

The specific areas within the topic of economic education that industrial arts can make major contributions are

1. developing major economic concepts.
2. understanding the economic system.
3. introducing resource allocation and income distribution.
4. introducing industry as a major economic institution.
5. relating societal goals to industrial activities.

Industrial arts uses the economic institution *industry* and its technologies as a base for program development. It is a program in which economics is a data source for studying decision-making in personal, political, and the working aspects of each individual's life.

CHARACTERISTICS OF THE ISSUE

Each day the countries of the world become more involved in economic decisions and trading relationships. This tightening dependence of each country on other countries in the world community requires citizens to become more knowledgeable and intellectually sophisticated.

One area of knowledge is that of basic economics. In a democracy each citizen, as a contributing member of the society, must possess economic literacy. Dumke (1976) described this type of literacy as "the ability of our citizens to cope effectively with economic dimensions of public questions and with the economic dimensions of their daily lives" (p. 729).

Bower (1969) supported the need for economic understanding by suggesting "every person and every nation must make choices. These choices are economic choices and to make them soundly in terms of his best interests the person and the nation need economic understanding" (p. 65).

Popular opinion and research suggests, however, that the average American is not economically literate. *Dun's Review* ("Keynes Goes to Kindergarten," 1977) stated that "each year, close to 3 million students are graduated from U.S. high schools, most of them deplorably illiterate in the fundamentals of everyday economics" (p. 42).

In a recent speech, Jaicks (1975) supported this point and quoted the late Luther Hodges, then Secretary of Commerce: "If ignorance paid dividends, most Americans could make a fortune out of what they *don't* know about economics" (p. 170). Later in the speech, Jaicks elaborated on the economic illiteracy of Americans by presenting the following comment attributed to Irving Kristor, educator and social analyst: "How have we managed to raise a whole generation of young people who do not know how their parents make a living?" (p. 170).

Podesta (1976), p. 111) supported the case that Americans lack sufficient understanding of economics by citing the results of several studies. Included in these findings were the following:

1. Fifty percent of all high school students could not distinguish between collectivism and a free enterprise society.
2. Fifty percent of all high school students did not know the United States economy was based on free enterprise.
3. The median estimate of the United States public was that corporate profits were 28% on the sales dollar when they were actually about 6%.
4. The interrelationship of business, labor, investors, and so forth in the economic system was understood by 1 in 7 Americans at large and by only 1 in 3 businessmen.

5. A substantial number of Americans view themselves as playing a passive role in the economic system—as consumers who spend money. Only one-half of employed people recognized their role as producers or providers of service.

In reviewing these findings, one may well conclude that the economic understanding of the typical American is incomplete and fragmentary; that few adults are highly knowledgeable and few are totally informed about the workings of the economy (Crosby, Kennear, & Taylor, 1977); and that the true "Eighth wonder of the world is the American Economic System and that the Ninth is the American people's ignorance of it" (Amway Corp., 1975, p. iii). Yet it seems apparent that if we want to continue to enjoy the benefits of a free enterprise system, youths must be presented with basic economic education. For, as Riley ("What Business Needs To Do," 1975) said, "We cannot maintain the benefits of free enterprise in an adversary climate. Free enterprise must be understood or we will drift closer and closer to the brink of a controlled economy" (p. 149).

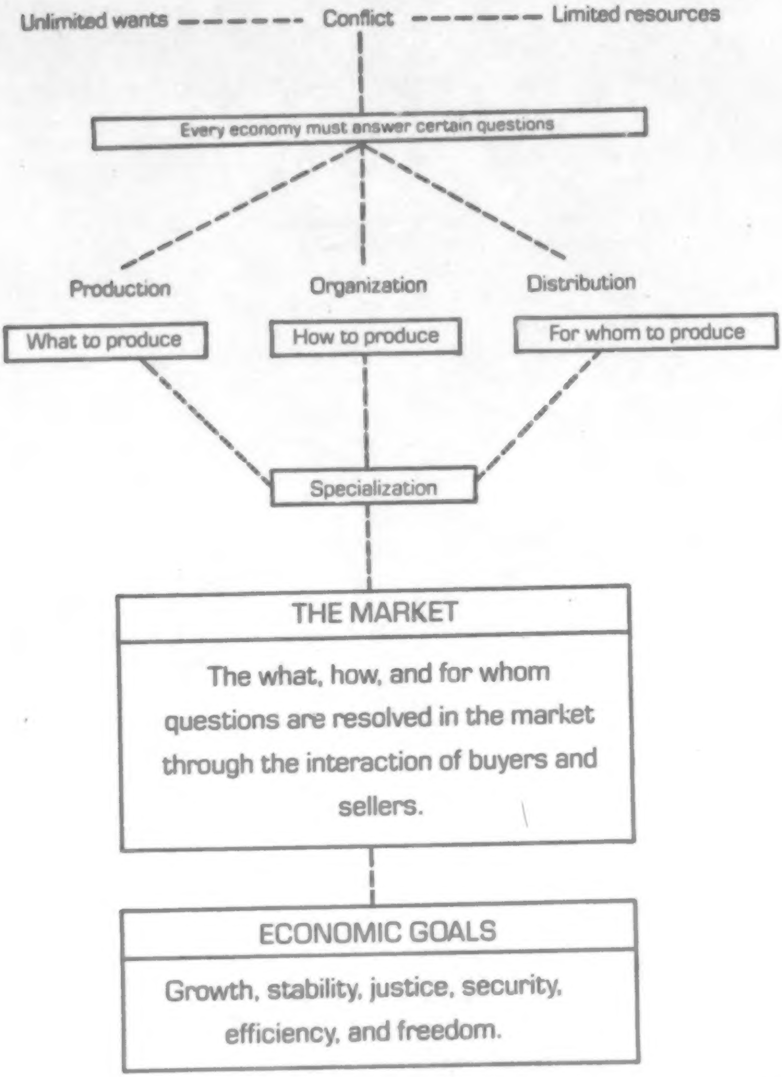
REVIEW OF THE LITERATURE

But what is economic education and how is it achieved? This seems to be a question facing many contemporary educators. Obviously economic education uses economics for its base. For this discussion, *economics* will be defined as a "study of how a society allocates its resources" (Amway, 1975, p. x). The allocation of resources requires choices among alternatives, with each choice requiring some type of trade-off; that is, a determination and acceptance of the positive and negative impacts of each decision. The wisdom that is brought to bear on the decision-making process will, in a large measure, determine the effectiveness of the economic system.

According to the authors of *Choice* (Amway, 1975), every economy faces three major decisions: what to produce, how to produce, and for whom to produce. These decisions are made differently in free societies than they are in controlled ones. In the American society the most influential source of information for the decision-making process is the marketplace. Supply-and-demand factors play a heavy role in the "what, how, and for whom" production decisions. Figure 11-1 (Amway, 1975, p. xi) summarizes our economy and the world of work.

As free individuals in the economy, we must make many decisions. These decisions may be classified in three major categories: citizenship decisions, personal decisions, and producer decisions.

Figure 11–1
A Conceptual Diagram for Economics and Our World of Work


Unlimited wants
Conflict
Limited resources
Every economy must answer certain questions
Production
Organization
Distribution
What to produce
How to produce
For whom to produce
Specialization
THE MARKET
ECONOMIC GOALS

The what, how, and for whom questions are resolved in the market through the interaction of buyers and sellers.

Growth, stability, justice, security, efficiency, and freedom.

As citizens we must use our economic knowledge to fulfill our responsibilities as voters and officeholders in the community, state, and nation. This requires each person to take positions on issues and problems, such as taxes, school bonds, energy, inflation, resource conservation, government spending, welfare, unemployment, and a myriad of similar topics.

As a free individual in the roles of householder, consumer, investor, saver, and borrower, each person must make difficult decisions on the allocation of personal resources and income. Economic knowledge is used to weigh short-term and long-term consequences of each personal financial decision.

As a producer of goods or services, each individual must make intelligent decisions in the role of worker, manager, technician, or professional person. These job-related decisions all have economic implications for both the individual and the community, state, and nation (Dumke, 1976).

The facts of economics and their application to the issues of the day shape the realities of our everyday lives. These facts allow us to take intelligent positions on down-to-earth problems (Jaicks, 1975).

Economic education is therefore essential education for living and is not necessarily to be viewed as a separate subject for school purposes. Dumke (1976) suggested that economic education should be a strand running through all school experiences. It should not dictate what to think. Good economic education involves a non-ideological, nonpartisan, objective presentation of basic economic knowledge designed to develop an individual's ability to (a) think effectively about economic problems, (b) make wise decisions based on sound values, and (c) apply these decisions in the economic areas of their lives and of society.

Also, to be most effective, economic education should be *activity centered:* Students should be actively involved in the study rather than observers and listeners. Lavender and Pardini (1978) presented this point through a quote of Scott Alexander, Arizona State Senator. Alexander said:

> I think the way the free enterprise system gets sold is when you get into it and learn what making a profit is all about and how you can utilize your own ability to set your own income level. I don't think you can sit down and brainwash somebody with the free enterprise system out of a textbook. (p. 18)

Similarly Weldon Shofstall, former Arizona state superintendent of schools, described a program with "high levels of interest and enthusiasm" that was being developed from existing industrial arts and vocational education materials. The program "stresses the essentials and benefits of the free enterprise system by organizing and operating enterprises within the curricular structure." He further stated that the students were being introduced to free enterprise in a doing setting (Lavender & Pardini, 1978, p. 18).

Similar industrial arts programs have been developed in other states under the titles of "Enterprise" or "Manufacturing." Ritz (1980) reported that curriculum guides for such courses are available from Arizona, Florida, Georgia, Hawaii, Idaho, Maine, Mississippi, New Mexico, North Dakota, Virginia, and Wisconsin.

Supporting the need for effective economic education, Bower (1969) stated that the school system's goal is "to prepare our children for responsible and effective citizenship" (pp. 66–67) and "since our electorate must make choices, . . . education has a responsibility to do more to equip our future citizens to make these choices rationally" (p. 69). This responsibility weighs heavily on the school because an increasingly larger portion of our national, local, and individual choices require economic knowledge and, of course, an economically illiterate electorate cannot be expected to vote wisely on economic issues.

However, Bower (1969) emphasized that economic understandings and rational reasoning are useful in areas beyond voting on national and local issues. He stated "economic literacy will help individuals deal more wisely with his own affairs and those of his family" (p. 69). Typical of the everyday personal decisions many of us are called on to make is the choice between a new car or a vacation and such decisions as whether to quit school or change jobs.

Bower (1969) concluded his plea for economic education by writing, "A reasonable level of economic understanding, it seems to me, is an essential part of the equipment of every American for effective citizenship" (p. 70).

Every American, however, does not need to be an economist. A major task is to winnow the essential general economic information needed by all from the vast store of economic knowledge. Economic education should provide those general concepts that have usefulness in meeting an individual's responsibilities to himself or herself and to the society. These basic concepts have been listed and categorized by Hansen, Bach, Calderwood, and Saunders (1977) for the Joint Council on Economic Education as follows:

BASIC ECONOMIC CONCEPTS
The Basic Economic Problem
1. Economic Wants
2. Productive Resources
3. Scarcity and Choices

4. Opportunity Costs and Trade-Offs
5. Marginalism and Equilibrium

Economic Systems

6. Nature and Types of Economic Systems
7. Economic Incentives
8. Specialization, Comparative Advantage, and the Division of Labor
9. Voluntary Exchange
10. Interdependence
11. Government Intervention and Regulation

Microeconomics: Resource Allocation and Income Distribution

12. Markets, Supply and Demand
13. The Price Mechanism
14. Competition and Market Structure
15. "Market Failures": Information Costs, Resource Immobility, Externalities, etc.
16. Income Distribution and Government Redistribution

Macroeconomics: Economic Stability and Growth

17. Aggregate Supply and Productive Capacity
18. Aggregate Demand: Unemployment and Inflation
19. Price Level Changes
20. Money and Monetary Policy
21. Fiscal Policy: Taxes, Expenditures, and Transfers
22. Economic Growth
23. Savings, Investment, and Productivity

The World Economy

24. International Economics (uses the concepts above)

ECONOMIC INSTITUTIONS

MEASUREMENT CONCEPTS

1. Amounts Versus Rates
2. Averages and Distribution Around the Average
3. Real Versus Nominal
4. Ratios
5. Index Numbers
6. Tables
7. Graphs and Charts

CONCEPTS FOR EVALUATING ECONOMIC ACTIONS AND POLICIES

Broad Social Goals

Freedom, Economic Efficiency, Equity, Full Employment, Price Stability, Security, Growth, Other Goals

Trade-Offs Among Goals
Self Interest and Personal Values. (p. 8)

These authors further suggested that the essence of economic understanding lies in being able to make sense out of an ever-changing array of economic issues. This requires that the various elements of economic understanding be combined to form a working knowledge of economics. The key elements of economic understanding are as follows:

1. **Practicing a reasoned approach.** Students must recognize that economic issues can be analyzed effectively only by replacing emotional judgments with an objective, rational, and systematic approach—a reasoned approach.
2. **Mastering the basic concepts.** Students must have at their command a set of basic concepts to give them the capacity to think about economic issues in a reasoned way.
3. **Possessing an overview of the economy.** Students need a simple overview of how the economic system works so as to provide a structure for examining specific issues.
4. **Identifying the issues.** Students must possess the knowledge and skills to recognize the various types of economic issues they are likely to encounter as consumers, workers, citizens, and employers.
5. **Applying these elements to practical issues.** Students must be given practice in using the reasoned approach, issues, first on simple and then on more complex real-world issues.
6. **Reaching decisions on economic issues.** Students must learn how to take the final step of forming their own judgments on economic issues. This requires making decisions based on their analysis of the issues, tempered by their own values. (p. 4)

Economic education, then, is a study that can be encompassed in any or all subjects of the school. It is a body of information and a way of thinking. Finally, it is an area that needs the direct attention of educators if we want to increase economic understanding among youth. Certainly, we may conclude, as did Spitzer (1977), "that the time has arrived for all interested parties—legislators, leaders of business and industry, educators and students—to engage cooperatively in the search for more creative approaches than those on which we are presently depending" (p. 44).

One creative approach would be to recognize the contributions of industrial arts to economic education and to modify industrial arts programs to further contribute to an increasing need for economic education.

CONTRIBUTIONS THAT INDUSTRIAL ARTS CAN MAKE TO ECONOMIC EDUCATION

Industrial arts, being a study of the individual's productive activities, contributes directly to developing many facets of citizenship knowledge for each student. It contributes to the understanding of the processing and management technologies of industry. It also provides opportunities to explore a myriad of careers associated with industry and technology and provides the forum in which economic concepts can be discussed and developed through student-centered activities involving simulations of real-life decision-making situations.

Following are but a few selected samples of the many industrial arts classroom/laboratory activities that help develop one or more of the 24 basic concepts listed for the Joint Council on Economic Education. These and other activities can be and are being used to varying degrees in contemporary industrial arts programs.

1. **Activity:** Product (Project) or Service Selection Activities

   Most industrial arts classes involve building a product or completing a service activity. The product may be the custom-built item typically completed in woodworking, metalworking, and plastic classes or a line-produced item in a manufacturing class. The product may be built on-site as in construction or in-plant as in manufacturing. It may be a communication product, such as a printed item or a recorded program. Also, service activities, such as engine repair, electronic device repair and similar maintenance activity, may be performed.

   The selection of the product or service activity for any industrial arts class contains many valuable learning opportunities when approached through student-centered or student/teacher interaction modes. Many of these opportunities are directly related to economic education.

Economic Principles Taught[1]

1. Satisfying people's wants for goods and services is the main purpose of economic activity.
2. Product and service choices are tempered by the availability of natural resources, human resources, and capital goods.
3. Resources are limited and human wants are extensive.
4. The decision to produce one item or service means giving up the opportunity to produce something else.

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[1] The economic principles presented here and in later activity sections are adapted from Hansen et al. (1977).

Industrial Arts Classroom/Laboratory Activities

The following activities have been or are suggested to be used in teaching the identified economic concepts along with the product or service design activities normally taught in industrial arts.

   1. Have each student list all his or her wants for goods and services, then circle those not available through the economic system. Discuss the effectiveness of the economic system in satisfying people's material wants.
   2. Select a want that can be satisfied through a product or service produced in the industrial arts laboratory. Design the product or service.
   3. Analyze the design in terms of the resources needed:
      - Human resources—physical and mental requirements.
      - Natural resources—list materials needed.
      - Capital goods—list machines and tools needed.

      Then, make recommendations for design changes that would reduce the quantities of human, natural, and capital resources needed. Simplify the design.
   4. List the products or services that could be produced using the same resources but cannot be because of the decision to produce the selected item. Is the selected item the best use of the resources?

2. **Activity:** Select Materials and Hardware to Build a Product

   At some point, each student and/or teacher must select the materials and hardware to build a selected product. This may involve choosing the wood to make a lamp or the paper for a greeting card. The selection, if wisely made, will involve certain economic considerations.

Economic Principles Taught

   1. Each choice of materials, products or services involves a trade-off.
   2. Each decision has its opportunity costs: the loss of alternate opportunities when the final decision is made.
   3. The scarcity of resources compared to people's total economic wants requires choices.

Industrial Arts Classroom/Laboratory Activities

Often material and hardware choices are made with a reasoned approach. Good industrial arts practices require students to justify their selections through answering questions like the following:

1. What material is best suited for the product?
2. What alternate materials are available?
3. What would be the effect of choosing a cheaper or more readily available material on the following: (a) product function, (b) product appearance, (c) ease of manufacture, (d) skill required to work the material, and (e) machines required to process the material?
4. List other uses for your selected material. Is your proposed use the best use?

3. **Activity:** Product or Service Financial Analysis

Nearly every student in industrial arts must account for the materials used in producing selected products or services. Some teachers enlarge this activity into a complete financial analysis, which provides opportunities to teach several important economic concepts.

Economic Principles Taught

1. Market prices are the principal allocation mechanism of the American economy.
2. Materials, labor, capital, products, and services all have a market price.
3. Value is added to materials at each step of the process of transforming materials to finished goods.
4. The difference between the price paid for the resources used to produce and distribute products and services and the price paid by the consumer for them is profit.
5. Wages are economic incentives for workers as profits are for enterprises.

Industrial Arts Classroom/Laboratory Activities

The following financial analysis activities have been used by industrial arts teachers to provide a more complete understanding of the cost of a product or a service:

1. Prepare a bill of materials to list all materials needed to build the product chosen by the student or class. Calculate the cost of each item to determine the product material cost.
2. Discuss the value added at each step of transforming a raw material into a finished good. Discuss profit at each of these steps.

3. Prepare a bill of labor to determine the amount of human labor needed to build the product.
4. Determine the value of the capital resources to be used in producing the product: Then, assign a portion of the total capital investment to each product.
5. Discuss the formula: MMW = NR + HE × T, when MMW is man's material welfare; NR is natural resources; HE is human energy; and T is tools (capital).
6 Establish the administrative and marketing costs for the product.
7. Determine the total cost of the product.
8 Determine the profit rate you would want if you were to commercialize your product; then determine the selling price that would produce the desired profit.
9 Discuss the relation of market prices for materials, labor, and capital to selling prices and profits.
10. Discuss supply and demand for materials, labor, and capital resources and for products. Relate this discussion to profits.

4 **Activity:** Developing a Student Personnel System

Industrial arts has long used student personnel systems. Their use falls into two types: (a) a system to oversee the management, maintenance, and/or clean-up of laboratories in which students study various aspects of woodworking, metalworking, graphic arts, plastics, power, and other similar areas; and (b) a system to staff a model enterprise charged with the task of designing, engineering, producing, and marketing a product or a service. The latter system is usually found in manufacturing, construction, and communication programs and in specific curricula, such as the *Maryland Plan* and the *American Industry Project* (Cochran, 1970).

Economic Principles Taught

1. Modern economic systems are based on specialization of labor because it permits scarce resources to be used effectively.
2. Specialization occurs when an enterprise produces a narrower range of goods and services than it consumes.
3. Workers are more productive as they narrow their areas of specialization (division of labor).
4. Division of labor causes individuals to purchase a number of goods and services from others.

Industrial Arts Classroom/Laboratory Activities

The common industrial arts personnel system activities have been or should be enhanced through the inclusion of the following economic education related activities:

1. Discuss the various jobs in the personnel system in terms of (a) work performed, (b) skill required, (c) education and training required, (d) hazards associated with the job, and (e) probable pay in terms of other jobs in the system. Correlate the student personnel system jobs with actual jobs in industry.
2. Have one group build a simple product, with each individual completing the entire product. Have the second group organize so that each member completes a portion of the total task of building the product.
    a. Compare the efficiency of group A with group B.
    b. Contrast the product quality between the groups.
    c. Discuss the advantages and disadvantages of division of labor found in continuous production.
3. Discuss why the modern worker must exchange the fruits of his or her labors (money) with a great many people while the cave dwellers did not.

5. **Activity:** Produce a Product Using the Line Production Technique

Many classes in industrial arts study the continuous line production of a product. This is sometimes done as a unit of study in metalworking, plastics, and woodworking classes and sometimes done as a major part of a manufacturing class, a Maryland Plan class or an American Industry course. This activity provides a wealth of opportunities to present a variety of economic concepts along with other types of learnings.

Economic Principles Taught

1. It takes natural, human, and capital resources to meet economic needs.
2. Capitalism is based on a market economy with decentralized decision-making.
3. Prices act as a signal, telling producers what consumers want; prices also allocate productive resources and finished goods within the economy.
4. Profits are the economic incentives for enterprises.
5. Specialization and division of labor increases productivity.
6. Competitive advantage will determine which company in which country will produce each particular good or service.

7. People and enterprises in the economy are interdependent.
8. Government regulation and intervention play a part in the paradigm—what to produce, how to produce, for whom to produce.
9. The market is the mechanism in which buyers and sellers determine the quantity of goods and services to be made available (supply and demand).
10. Prices are signals to individuals and enterprises that help in making decisions involving allocation of individual and company resources.
11. The more complex the market structure (degree of competition in a particular market), the less control a single enterprise has over prices, profit levels, and supply of goods and services.
12. Economic growth involves increasing the total output of the economy and the productivity of individual workers.

Industrial Arts Classroom/Laboratory Activities

Designing for production and producing products using the continuous line production technique are complex activities involving many tasks accomplished over an extended period of time. A simplified list of typical tasks accomplished by students follows:

1. Select a product to build for which human, material, and capital resources are available. (See the activity on product selection.)
2. Determine the market prices for the resources and the proposed product.
3. Determine the anticipated demand for the proposed product.
4. Determine the anticipated profit for the product. (See the activity on financial analysis.)
5. Decide if there is a sufficient market to warrant the introduction of the product.
6. Design a system to produce the desired quantity of products within the allocated time and to the specified quality standards.
7. Employ and train workers (students). (See the activity on personnel systems.)
8. Manufacture the product.
9. Design and implement a product promotion plan.
10. Sell the products.

11. Close the activity by paying for all resources and distributing the profits.
12. Discuss the market in terms of (a) acceptance of the product, (b) price of the product, (c) competition, and (d) profit.
13. Discuss government regulation as a factor in determining (a) the design of the product, (b) the design of the production system, (c) cost of the resources, and (d) profit.

6. **Activity:** Seeking Alternate Energy Sources

   Many industrial arts classes, particularly those in the power and energy and the transportation areas, have major units in energy generation, transportation, and use. Within these courses is usually found a study of alternate energy sources. This study is ripe with economic principles needed by citizens for their understanding of today's serious energy problems.

Economic Principles Taught

1. Consumers' wants often outstrip the availability of selected products.
2. Each economic decision involves trade-offs: comparing the physical and financial costs with the expected benefits.
3. Natural resources are limited.
4. Government influences the allocation of resources in several ways.
5. As demand of a product or service exceeds the supply, market prices rise.
6. As competition decreases, market prices usually rise.
7. Domestic economies are affected by the economic relations among other nations.

Industrial Arts Classroom/Laboratory Activities

1. Discuss the energy crisis and list ways of easing it.
2. Develop an experiment or working model to demonstrate an alternate energy source. Then (a) list its advantages, (b) list its disadvantages, and (c) list the trade-offs in terms of the environment, cost, and so on that would have to be accepted if full-scale adoption of this method was considered.
3. Describe how government regulation has affected the energy crisis and the introduction of alternate energy systems.

7. **Activity:** Teaching About Broad Social Goals

   Industrial arts has a role in developing understandings related to the six broad social goals described by the Joint Council on

Economic Education. These goals are the context around which the decision-making of economics is centered. They vary from one society to another and among groups and individuals within a society. The goals most commonly found in the modern world in general, and in America in particular, are freedom, economic efficiency, equity, security, stability (full employment without inflation), and growth (Hansen et al., 1977, p. 25).

Economic Principles Taught

Through activities of designing products, developing personnel systems, designing systems to produce products, and the production of selected products, the study of the following economic principles associated with the broad social goals may be included:

1. Economic freedoms appear in the marketplace and include (a) freedom of consumers to decide how to allocate their money among the goods and services offered; (b) freedom of workers to select a job, join a union, and participate in a strike; (c) freedom to establish a business and determine what will be produced and the methods to use in producing it; and (d) freedom of savers and investors to decide how much to save and where to invest their savings.
2. Technical efficiency involves using the minimum amount of resources to obtain a desired level of output.
3. Economic efficiency is a balance between the total cost and the total benefits for each course of action.
4. Each economic decision must consider equity; that is, what groups are better off or worse off because of the decision.
5. Equity involves the income distribution effects of economic decisions.
6. Full employment increases the use of human resources and reduces the individual's economic hardships.
7. Inflation causes all areas of the economy to make costly adjustments to offset the effects of rising prices.
8. Individuals desire protection against economic risks, such as unemployment, destitution in old age, bank failures, and severe price declines in one's product.
9. Growth is a long-term process producing a broad range of benefits.

Industrial Arts Classroom/Laboratory Activities

The broad goals of society are not something best taught through a unit of study but are more effectively developed as they are integrated into appropriate other units of study. In industrial arts, the principles listed above can be and are often successfully woven into other major activities.

For example, freedom of consumers to spend their money as they wish is an important part of a study of product design and approval. A survey of potential customers' views of the product and their willingness to buy it is one major data source for the product introduction decision.

Likewise, the freedom for workers to apply for positions, form unions, and to strike are all important concepts that may be covered when developing the work force for line producing a product in a manufacturing unit or class.

Forming a union and then bargaining for benefits in a manufacturing, construction, or communication class or in the Maryland Plan and American Industry program helps develop the concept of the individual's desire for protection against economic risks.

The three examples above are but samples of how the knowledge of the broad social goals may be developed through integrating their study into larger units of study in industrial arts. The number of ways to accomplish this task are numerous and available to all creative industrial arts teachers.

SUMMARY

Obviously, as the data and discussions indicate, not enough is being done in the area of economic education. Each school subject, including industrial arts, has a role to play in developing an intelligent member of society: one who possesses economic, technological, career, and cultural literacy.

Industrial arts has initiated such action with major curriculum projects like the Maryland Plan, the Industrial Arts Curriculum Project, and the American Industry Project and through a movement by others to accept a new content base of industry and technology in classes like manufacturing, construction, power and energy, communications, materials and processes, and transportation (Cochran, 1970).

This movement to study society through industry and its associated technologies involves the study of resources, techniques, systems, management, and products, all of which were developed partly through economic decision-making. As industrial arts continues to be modified to provide the necessary education for the future citizens of the 21st century, economic education will surely become an even more integral part of the field.

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Chapter 12

Industrial Arts and Its Contribution to Consumer Education

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THE ISSUE

Industrial arts has a significant role to play in the development of consumer skills and understandings. The unique content and experiential processes of industrial arts education can make an important contribution to consumerism.

According to Kelso (1975), 34.7 million adult Americans are generally unable to meet basic consumer competency requirements, and 39 million more function with bare proficiency. Kelso found adult competency in consumer education and economics woefully low with little improvement shown by those with more education. Less than 30% of adults with an eighth-grade education and 38% of adults with a secondary education could cope with basic consumer education subject matter.

These percentages show that the adult American consumer is in need of such education. Living in a complex industrial society—bombarded by advertising and hindered by ignorance—too few individuals are prepared to answer key questions concerning cost, quality, and need when they venture into the marketplace. Too few possess clear values and attitudes concerning the business-consumer relationship. Too few have developed a rational, logical process in dealing with consumer questions.

Such considerations are the province of consumer education, an endeavor rather pedantically defined by the United States Office of Consumer Education as "an effort to prepare customers for participation in the marketplace or for situations involving use of resources, public and private, by imparting the understandings, attitudes and skills which will enable them to make rational and intelligent recognition of marketplace alternatives and social, economic and ecological considerations (U.S. Office of Education, 1977, p. v).

The "effort to prepare customers for participation" is one which industrial arts teachers are well qualified to undertake because consumer education "is neither a theoretical or abstract subject area, nor a standardized body of knowledge. It is most effective when it focuses on the consumer experiences, problems and interests of students" ("The Business Community and Consumerism," 1974, p. 6).

The experiential nature of industrial arts—an area of study that involves materials, tools, equipment, their costs, and the quality and grade of products—can focus the various theories of consumerism into hard reality. The industrial arts program can make a significant contribution in the area of consumer education through concrete, relevant learning.

CHARACTERISTICS OF THE ISSUE

There is no real debate about the need for consumer education. The nature of the need is another question. MacDowell and Niss (1976) go far beyond the generally agreed on position that the consumer must be strongly and adequately prepared to make choices on individual purchases of goods and services. They contend that a good consumer education program is needed to enable students to select an occupation or vocation which provides both a psychological or philosophical reward and an adequate income for life's necessities. Moreover, a good consumer education program can give consumers the opportunity to become informed and can provide governmental and private agencies with public opinion on policy decisions made on the national level.

Although the need for consumer education is generally recognized, there is no real consensus on a working definition of what consumer education is. Current concepts of consumer education are evolving and changing. Traditionally, consumer education has been centered on wise buying, comparison shopping, and analyzing various industrial products, materials, and other marketable goods. Although these are important aspects of consumer education, the educational process is now assisting students in making other kinds of individual choices.

Many of these choices have been engendered by technological changes found in our society. The phrase *post-industrial society* has been used to indicate a society in which industrial production is no longer the dominant economic activity. Such a society provides choices through an overabundance of industrial products and services available to customers.

All people, youngsters as well as adults, need to have consumer information available to them to make intelligent decisions. If they are to have the resources to make good decisions, consumer education must provide the methods for strengthening individual life-styles and economic worth as well as meeting the total economic and social needs of our nation.

Obviously, such a goal goes beyond the traditional secondary curriculum into adult education and programs of governmental agencies. According to Davis (1974), many consumer education advocates believe that this social consumer aspect is on the verge of developing into a significant area. Some of this concern and interest was intensified in March 1962, when President Kennedy delivered his "Special Message on Protecting the Consumer." In that speech, Kennedy indicated that it was a fundamental right of customers to have the right to choose, the right of customer safety, the right to be heard, and the right to be informed (Davis, 1974).

In addition to the social aspect of consumer education centered on how persons spend their income, the process of decision-making has received more emphasis. MacDowell and Niss (1976) report more sophisticated programs concerning the process of making a choice and the factors involved in developing rational, acceptable, and profitable solutions when confronted with decisions concerning the purchase of goods and services. In the contemporary educational system, consumer education is centered on making rational and logical decisions rather than on purchasing goods by habit or impulse developed by intense advertising campaigns.

MacDowell and Niss (1976) define those who use this rational process by listing three basic decision-making bodies:

1. families or individuals who evaluate goods or services and determine whether or not they should be purchased with available income.

2. industrial or business firms that must determine what they will produce or sell. Usually, these decisions are made with consideration of the needs and demands expressed by household decision-makers. This requires a careful interpretation of the decision-making process of the consumer when industry attempts to manufacture products.
3. individuals who are required to make decisions that have implications for the public domain must be aware of consumer education. These elected or appointed groups make choices for the entire country at the local, state, or national levels centered on the productive capacity of our industrial and business areas.

Regardless of the decision-making body, it is clear that consumer education must be concerned with more than buying products. It involves helping individuals clarify issues and values and develop problem-solving and decision-making skills. Consumer education not only asks the individual to make consumer role decisions, but it requires the evaluation of behavior and attitudes and the examination of business and consumer problems in a logical and productive way (English, 1978).

The rationality and logic so universally applauded in discussions on consumer education is complicated by the multiple roles an individual plays, often simultaneously, in today's society. They are (a) a contributing worker in the production of goods and services; (b) a consumer of goods and services; and (c) a voting member of a society that makes joint economic decisions. Often these roles conflict, and no amount of consumer education or ration of logic can eliminate the conflict.

For example, take the U.S. wheat embargo on the USSR. What is self-interest? What is the common good? What is an empty gesture? The answers vary according to who is answering them: a Congressman from Kansas, a fisherman from Maine, and a grocery store manager in California.

One final aspect of consumer education has to do with where it should be taught and who should pay for it. McNeal (1978) indicates the responsibility for consumer education is now placed on the public schools, with the main emphasis on how to get satisfaction from products. There is a question as to whether or not it should be the total responsibility of the schools. Many government and consumer advocates suggest that more of the responsibility for consumer education should be placed on the shoulders of the business and industrial community.

REVIEW OF THE LITERATURE

The consumer education movement was first accepted in the 1930s and early 1940s. The philosophy of education during that era favored responding to concerns in everyday life. Several areas of study (e.g., arithmetic, home economics, business education, and industrial arts) made an effort to incorporate consumer education in their program (Wilhelms, 1979).

Consumer education is an important part of American education because it has long stressed the need for preparation for living. Many educators in such subject areas as industrial arts, mathematics, physical education, and health have made contributions to the preparation of students to become better consumers. Because of the awakened interest in consumer education in the 1960s, consumer educators developed new concepts and procedures for implementing the content of their subject. Under Public Law 92-318 signed by President Nixon in 1972, the U.S. Office of Education was charged to create a position of Director for Consumer Education with the authority to undertake research and develop curriculum. At that time, 20 million dollars were authorized for this function. In addition, numerous state departments of education, private groups, and the federal government developed projects that ultimately strengthened consumer education (Richardson, 1972).

Wilhelms (1979) reported that approximately 64% of the states and territories indicated they had an approved definition of consumer education. Nineteen states and territories reported that a statewide survey of consumer education had been completed in the past five years; and 18 states and territories had a statewide consumer education program in their public schools. Seven states and territories had a special state certification requirement or endorsement for individuals teaching consumer education. Wilhelms (1979) indicated that "if not all, practically every state has a consumer education requirement as part of its home economics certification requirements" (p. 10). Forty states and territories had a preservice or in-service teacher education program provided by some educational agency at the state or university level. In general, these programs were found in the home economics or social studies area.

According to Warmke (1974), the basic objectives of consumer education are

1. to promote an understanding of the roles a person must perform as a worker, consumer and citizen voter.
2. to provide an understanding of money management skills required in borrowing, saving, investing and spending.

3. to provide an understanding of the relationship that exists between major components of the economy such as consumers, producers, government and trade.
4. to provide an understanding between economic analysis and the problems found in society These would include the energy crisis, inflation, poverty, crime, racism, taxation, labor and business.

Chandler (1974) reported there has been little agreement in regard to what areas of consumer education should be taught in our schools. Many areas have been included, such as family budgeting, product testing, information, and thrift. In some cases, programs of study have been centered on dishonest business practices found in the marketplace. Some leaders in consumer education have advocated specific or special courses, and many have requested that it be included in industrial arts, business education, social studies, and home economics. This debate had been going on for several years and continued in the 1970s.

Cosby (1979) found that providing individuals with information and education concerning consumer education seemed to enhance their ability to assess product performance and to determine what they needed in a product. He also found that it improved the quality of their decision-making. Therefore, he concluded that consumer education served a role of helping participants determine their needs and then judge the performance of the product.

Jackson (1977) stated that if students are to develop strength and competencies needed to become consumer oriented, they must be carefully nurtured in selected learning activities. She listed the following guidelines that can be helpful in the selection process:

1. Activities should be centered on the interrelationship of learning behaviors.
2. Activities should make use of the flexibility and diversity of the student body. The different values, motivations, lifestyles, and knowledgeable backgrounds of the students are an asset in the study of consumer education.
3. Activities should challenge individuals to analyze their values and judgements.
4. Activities should involve active student participation.
5. Activities should be centered on the development and establishment of concepts and processes which will be of the most use to students in life situations. Activities should focus on the learner's current or future environment. (p. 25)

In a study on consumer educator competencies, Siewert (1978) found that the highest ranked goal of the study population was to assist students in developing standards of choice making, and the lowest ranked goal was to equip students to improve the social and economic mechanisms of society. Siewert (1978) also concluded that in secondary schools, teachers from various disciplines should be carefully evaluated before they are placed in consumer education positions to be sure they have competence in essential areas. It was indicated that secondary-level consumer education should be an interdisciplinary subject area, borrowing from a number of educational disciplines, including business education, home economics, and social studies.

MacDowell and Niss (1976) stated that the choice-making process in consumer education involves steps centered on budgeting, savings, and consumer protection. The steps include:

1. **Budgeting for current consumption.** A family must choose a method of allocating its income for the purchase of food, clothing and shelter. The same responsibility is found in regard to business firms that must allocate certain revenue to the production process and also to the investment process.
2. **Budgeting for future consumption savings.** Individuals must become aware of their role in allocating certain money for the saving category. One must analyze the complete savings process and determine the spendable income to be used in the future by developing a savings program. A concept must be developed concerning the value of saving and the specific cost and benefits of this postponement of spending money.
3. **Consumer use of credit.** The consumer must be aware of the proper use of credit and the advantages and disadvantages of credit. A person should be aware of the need to use credit to purchase certain goods required immediately and the consequences of postponing the purchase of needed materials when credit is not available. An individual must develop problem-solving solutions regarding the postponement of payment. (p. 8)

Warmke (1974) indicated that curricular change requires thought and motivation, and he suggested that the following concepts should be kept in mind: (a) personal economic decisions must be based on the context of the total society; (b) consumer education is not just concerned with purchasing goods or articles; (c) even when consumers are considered to be citizen voters or earners of an income, the overall role of the consumer is more significant; and (c) consumer education must be considered in the context of analyzing all of the problems of society. (p. 608)

Davis (1974) found that social studies teachers were more consumer oriented in their instruction than teachers from home economics and distributive education. She indicated that male teachers provided significantly more emphasis on consumer education issues than female teachers. Davis also found that teachers who had taken consumer education courses placed more emphasis on consumer issues than individuals who did not have consumer education courses in their background.

Toda et al. (1974) stated that consumer education has no motivation problem because it relates to the background and needs of the individual students regardless of the person's vocational choice. Because of this, students do the classwork and they frequently bring items from home for investigation.

Consumer education should begin in the elementary school. By the time a student is a senior in high school, he or she has established attitudes that will be difficult to change. ,Consumer education must be taught at lower levels, even down to the first grade.

Wilhelms (1979) found that the private sector emphasized the buying aspect of consumer education; however, credit, energy, and personal finance were also popular. The private sector considered the program they developed acceptable, both in school systems and community agencies, but the program was regarded as less acceptable or useful to the companies themselves.

Wilhelms (1979) also found that private sector programs were developed for secondary school students and adults, but several of their programs were used for senior citizens.

CONTRIBUTIONS INDUSTRIAL ARTS CAN MAKE TO CONSUMER EDUCATION

Many educators have considered the role of industrial arts in consumer education both from a theoretical and practical viewpoint. This section deals with both approaches, putting particular emphasis on practical experiences concerning the purchase of an automobile. It is intended that this practical emphasis would be seen as just one such experience that can be carried out in industrial arts classrooms.

Industrial arts teachers have been involved in teaching consumer information, usually from a practical standpoint, for a number of years. In many instances, their programs have centered on the development of consumer knowledge and skills in regard to tools, materials, and processes.

Industrial arts gives students the opportunity to use tools and power equipment to make products in their industrial arts programs.

The study might include items constructed using a variety of materials (e.g., woods, plastics, metal, ceramics, electronic equipment, and other industrial products). The industrial arts teacher is unique among most educators in that the area of content they use frequently centers on hands-on activities. This provides students with experiences in selecting, using, maintaining, and servicing industrial products (Ohio State Board of Education, 1971).

Buffer (1979) listed six general goals accomplished by student participation in consumer education oriented industrial arts. The goals included the development of

1. insight into and an understanding of socio-economic factors affecting industry and society including (a) economic system, (b) income procurement, (c) consumer behavior determinants, (d) consumer alternatives, (e) roles-rights-responsibilities, and (f) community resources.
2. talents, interests and attitudes as consumers of industrial products and services. What determines quality products and services? What does one need to know in order to evaluate a product or service? What can be done to ensure that people will be able to recognize quality?
3. abilities in the proper identification and use of tools, machines and processes. For example: What techniques do manufacturers use to provide quality goods? Do they cut corners which reduce product efficiency for lower costs? Is one technique of production less expensive but just as effective as another, and does the manufacturer pass the savings on to the consumer?
4. problem-solving and creative abilities involving industrial tools, materials and processes. Students will be able to critically analyze, select, use, diagnose and service industrial goods and select consumer services.
5. an awareness of the relationship of other academic subjects to industrial arts; for example, knowledge derived from the natural and physical sciences related to the analysis and selection of materials used to produce a structure or product. Should we continue to use steel in automobiles or should plastic resins be used to lower body weight and improve economy? How will the increased use of plastic affect design, function, safety and the balance of natural resources?
6. a familiarity with a variety of careers related to consumer protection and service and their requirements. As students have an opportunity to see and use products produced by a

> variety of companies, they must start to form ideas about which occupational role or product area meets their greatest expectations for a career. (p. 28)

Prager (1973) related that the consumer education gap is analyzed from the level of economic understanding as compared to the advancement of economic activity. Prager stated that the gap is widening because of inflation and other problems in the current economic setting. Efforts to close this gap can be developed in the industrial arts laboratory and can be centered on industrial arts activities that are concrete and life-like.

There are many ways in which the industrial arts experiences can contribute to the consumer education of the student. Some are as follows:

1. Consumer education as it relates to the construction of projects or objects in the program would include
   - the appropriate construction or structural features of the item.
   - the application of appropriate fastening devices such as the use of nails or screws.
   - the bracing or strength inducing units employed in the construction.
   - the nature of the finish on the object with respect to its use.
   - the design of the item with reference to its function.
   - the kinds and qualities of glues and adhesives in relation to the requirements of an object.
2. Consumer education as it relates to the kinds of materials used in the construction of projects or objects would include
   - the selection of appropriate wood, plastics, metals, paper, or ceramics for the function of the item.
   - the relative costs of construction materials such as with the following woods: fir, pine, cherry, walnut, or oak.
   - the appropriateness and relative cost of solid wood construction as opposed to laminates.
   - the workability and versatility of certain construction materials such as woods, plastics, metals, and ceramics.
   - the weather and corrosion resistance of various materials such as aluminum, copper, brass, and steel.
   - the resistance of materials to breakage, damage, or dents through normal use of the project.
   - the resistance of the finishes as well as the basic materials to stains and surface damage caused by foods, beverages, chemicals, or fumes in the normal use of the product.

- the effect of heat, moisture, and the natural elements on the construction and on the finish of the object.

3. Consumer education as it relates to the use of the products available to persons living in a democratic, industrialized nation might include
   - appropriate maintenance of equipment and tools commonly found in most homes.
   - effective maintenance of operational items such as electric motors, gasoline engines for lawnmowers and boats, and automobile engines.
   - safe operating procedures as they relate to home appliances, lawnmowers, outboard engines, and automobiles.
   - appropriate operation or use of tools, machines, engines, motors, and a range of equipment.
   - health hazards associated with the use of certain materials such as asbestos, lead paints, chemicals, exhaust gasses, finishes, thinners, and exposure to the electric welding arc.
   - the need for appropriate conditioning of tools and machines with regard to level of sharpness, adjustments required, guarding of dangerous units, appropriate electrical grounding, appropriate voltage and circuitry for various items, and exhaust requirements.

The degree to which many of the above items grow out of the industrial arts experience depends on the range of program and the extent of experience permitted students in their school program. The instruction in the above items and many more such concerns is carried out in the industrial arts program in an experiential, firsthand involvement on the part of the student. There is no more effective way of learning to use an item than to actually use it under good guidance and supervision.

Research and Experimentation in Industrial Arts. One of the most effective methodologies and programs employed in the total educational program for consumer education is what has been called research and experimentation in industrial arts. This is a widely acclaimed program developed in the Industrial Education Department at the University of Maryland (Maley, 1973). The students engage in consumer research related to the products, materials, and processes of industry. Each student identifies one or more research projects he or she wants to pursue. Many of these researchers are purely consumer education oriented and have included such studies as

- the effects of heat and cold on the usefulness of selected batteries.

- the effects of heat on different kinds of wood finishes.
- comparison of various soaps on the removal of dirt and stains.
- the fading qualities of fabrics and colors.
- the strength of wood joints, fasteners, glues, and adhesives.
- the comparative strengths of various sizes of dimensional lumber used in construction.
- the effectiveness of various exterior paints and finishes.
- the qualities of printing inks and papers used in printing.
- the resistance of finishes to stains or other damaging effects from beverages, food acids, and household use.
- the effectiveness of various floor finishes under varying wear conditions.
- comparison of various engine oils under varying conditions.
- comparisons of exhaust emissions, using various fuels as well as with alternate operating conditions in small gasoline engines.
- the effectiveness of various forms of boat hulls in reducing drag in the water.
- the heat transmission qualities of various insulating materials.
- the sound transmission qualities of various building materials.

There are hundreds of other challenging and interesting areas of consumer inquiry that the curious young researchers in industrial arts have pursued. It is consumer education (on a comparative basis) at its best. One learns relative value or effectiveness not by the use of a single item but by comparisons with other such items.

Line Production in Industrial Arts. This is an experience in which important consumer education goals may be achieved through industrial arts. Students organize a company, sell stock, develop a management and worker structure, design a product, tool up for production, produce the item, package, advertise, sell, redeem the stock, and dissolve the company. It is a process that is common to hundreds of programs across this nation. The nature and form of consumer education through this form of industrial arts include

- how capitalism functions.
- role involvement with management and worker tasks and responsibilities.
- a better understanding of product design and manufacture.
- a study of packaging requirements and applications.
- the study of the various options as well as actually carrying out an advertising campaign.

- investments in industry—common stocks, preferred stock, incorporation, bonds, stock market reports—and actually buying and selling stock.

Again, it is apparent that the life-like involvement of the students in industrial arts can and does produce forms of consumer education so vital to most citizens of today.

Schoenfeld (1965) discussed the possibility of providing consumer education experiences through high school assembly programs. This method (a) provides opportunities for outside speakers and experts to present their information; (b) allows speakers to arouse the interest and awareness of students; (c) provides the students and other individuals the opportunities to make comments and raise questions about various aspects about consumer education; (d) offers teachers the opportunities to be aware of the problem and inform themselves about the areas to be studied; and (e) provides a focal point of coordination throughout the school for various programs. (p. 57)

Schoenfeld (1965) described a pilot assembly developed around the industrial arts curriculum area of automotives entitled "Youth and Automobiles." The program included a panel of a coordinator, who acted as monitor; four students; a local automobile dealer; a local insurance agent; a local judge; and an automobile engineer from consumer's union. Each person presented some ideas in regard to his or her area of expertise. Then the students were asked to question the panel.

After the assembly, two classes in industrial arts met outdoors in the faculty parking lot to inspect a used car furnished by the automobile dealer who had participated in the assembly program. The consumer's union automobile engineer pointed out good and bad features of the used car, and he demonstrated some on-the-lot procedures to test an automobile to determine if it is a good buy.

The United States Office of Education (1977) developed the above project using an off-campus facility and a series of objectives to be met by students. This process was done through simulating certain processes students would go through. The following guide on transportation was developed by the United States Office of Education (1977) and centers on one of the basic areas of industrial arts.

Each student will simulate the selecting and buying of transportation.

Rationale: Transportation can be by car, motorcycle, bicycle, or public transportation. A person should have much self-understanding to choose the most suitable type of transportation.

1. Investigate the advantages and disadvantages of each type of transportation: car, motorcycle, bicycle, public transportation, other. Consider cost of operation, initial cost, credit charges if you get a loan, your needs, and so on.
   a. Complete evaluation list on transportation: advantages-disadvantages.
   b. Decide which type of transportation is best for you.
2. Complete a guidesheet for selecting either a
   a. used car
   b. new motorcycle
   c. used motorcycle
   d. bicycle
3. What insurance is needed for your transportation? How much will it cost? (p. 28)

The student filled out a list indicating the advantages and disadvantages of various methods of transportation including the automobile, motorcycle, and use of public transportation.

In analyzing the motorcycle purchase, the student is given a guide with necessary information and checklist. Other practical approaches are included in the *Industrial Arts Resource Supplement to Consumer Education Curriculum Guide for Ohio* (1971), which provides suggested learning activities for various learning concepts. Some of the activities suggested center on learning how a worker, such as a carpenter or welder, might manage his or her paycheck for goods, services, and savings. One suggested industrial arts activity was to sell stock in a hypothetical company and learn how capital is obtained.

Few instructional areas can use this activity more successfully than industrial arts programs. Students might find the gross national product of a current year and learn how it is computed. One activity was to compare the costs of similar goods produced by union and nonunion workers.

MacDowell and Niss (1976) indicated another important aspect of consumer education is adequate and rational choice making concerning one's vocation. Many consumer education programs do not take into account consumers and their source of income and the possibility that the source of income can be determined by vocational career choices. It is necessary for the student to make wise and adequate occupational choices that will affect the long term potential and consumption patterns he or she will have throughout life. The industrial arts experience can provide information which will assist individuals in making long term decisions and to become aware of their income potential.

English (1978) indicated that consumer education classes should be the most stimulating in the secondary level, and they should deal with real-life situations. He indicated that one way to arouse student interest was to provide them with the opportunity to have a voice in the topics to be discussed and studied. Consumer education through industrial arts may be enriched by using skits, speakers, field trips, films, and other activities that appeal to the students.

In an interview, Esther Peterson, Assistant Secretary of Labor during the Kennedy and Johnson administrations ("Adding the Consumer Perspective to Your Business Program," 1974), responded to the following question, How would you deal with consumer related subject areas in the classroom? She answers:

> First, I would ask the students to relate some of the consumer problems they were experiencing. Next, I would ask them what could be done about these problems and have them research the solution to their specific problem. Another interesting strategy is to have students select consumer recommendations that have been made in the past, find out what is happening to them, how business has responded to them. Be practical . . . have the class study some of the cases before the courts and regulatory agency involving deceptive advertising and unfair business practices and try to determine what's wrong within business that these practices have taken place so many times. Why, for example, are some firms packaging to price—the same packaging as before for the same price, but containing less in quantity? Have them gather information, and write a letter to a firm, asking them to justify this policy and explain why such a marketing decision was reached. When covering the loss, ask about the effect of the law and how it can be improved. No law comes out just right—they're all compromises, so it's important for students to look at laws from two viewpoints: What's good about it and how should it be changed? A consumer problem that desperately needs to be researched is what should be done to encourage supermarkets to locate in the inner city. (p. 15)

The commitment of industrial arts to strengthening consumer knowledge in young people has been a part of the program for many years. Wilber (1948) indicated that one of the major objectives of industrial arts was "to increase consumer knowledge to a point where students can select, buy, use and maintain the products of industry intelligently" (p. 50). Wilber was one of the early leaders in developing behavioral objectives. He stated that the expected behavior changes for students through industrial arts.

1. They will examine articles carefully and will judge their values before buying.
2. They will look for constructional features in judging the worth of an article.
3. They will learn about materials and will apply their knowledge in making purchases.
4. They will become acquainted with trade names and will look for proven brands when buying.
5. They will maintain and use manufactured articles in such a way to prolong their life and usefulness.
6. They will recognize quality and will buy accordingly.
7. They will buy on the basis of their needs, rather than entirely on the basis of price. (pp. 50–51)

The role of consumer education as one of the principal objectives of industrial arts has long been established. Industrial arts teachers analyze their instruction and try to provide experiences for young people that will assist them as "purchasers" in the contemporary society. The industrial arts field provides many experiences and opportunities to assist young people in this area. Local, state, and national curriculum groups should begin to recognize the contributions that industrial arts can make towards consumer education in their instruction. Industrial arts is unique in its opportunities for providing educational understandings associated with consumer education. The content and the experiential teaching processes in industrial arts make it an effective instructional program for a major contribution to consumer education.

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Chapter 13

Industrial Arts and Its Contribution to The Education of People for the Future

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THE ISSUE

Industrial arts has a major role to play in education for the future. The special nature of industrial arts allows it to have far-reaching relationships with other subject areas; serve as a means of developing knowledge, enabling students to examine technological alternatives to societal problems; provide an opportunity to explore change as an element of life; and help students explore how they can make a contribution in a future society. Industrial arts is a vehicle that may be used in the educational process to look into the future. By looking into the future, people may be more adequately attuned to the life experiences of the world in which they are about to live.

CHARACTERISTICS OF THE ISSUE

The use of technology has created a society characterized by a knowledge explosion, sophisticated communication and transportation systems, intricate manufacturing techniques, and environmental tradeoffs little understood by society or considered by educators (Kahn, Bruce, & Briggs, 1972; Toffler, 1971). Platt (1981) indicated that life on earth is nearing "the greatest turning point in four billion years" (p. 14), and never before have so many momentous developments occurred so closely together. These changes have resulted in the most unique age in the history of humankind.

Educating About Values and Technology for the Future

We have no precedent for this new technological society as we did in times like the Renaissance, when the regeneration of the human took place according to thoughts originating from the Greeks. Technological changes now take place with the world looking on through satellite communication systems that disseminate facts and convey information about events. Habits, values, and morals have changed as a result of society's greater awareness of issues and circumstances. Dobzhansky (1970) wrote that "by changing what he knows about the world, man changes the world he knows; and by changing the world in which he lives, man changes himself" (p. 30).

The future depends, in part, on the values fed into the decision-making process. Decisions depend on how well we understand and predict changes in values that regulate behavior. We have reached a time when all values are under strain and are constantly challenged. Few institutions, beliefs, or values can any longer be taken for granted. Technological change has had an important effect on our value systems. The influence of technology manifests itself in forms of convenience and leisure, such as home-based computers, instant photography, and entertainment centers as large as many cities. Technology has also manifested itself in pollution, conservation, and energy problems. Thus, technological innovations have had a great influence on our social and cultural understandings.

Educating About Technology and Change

Synonomous with the term *advancing technology* is the word *change*. Rapid social change is often attributed to advancing technology. Technology is considered to be the tools, machines, chemicals, and so forth that give human beings the ability to do things. Change often leads to more change, just as inventions cause more inventions. Members of our society have had problems adapting to change because (a) until the past few decades, change has not happened fast enough to require understanding or attention, and (b) little has been done to educate individuals for change. Change has always existed; Toffler's (1971) book, *Future Shock*, gave additional consideration to the elements or characteristics of change as applied to happenings in society. Fabun (1968) described change as it related to technology.

> Where communications are free and open, one technological change begets another, setting up a chain of innovations. When one chain—such as the invention of interchangeable, movable typefaces—is joined to another—such as the idea of assembly line processes in manufacturing—then such a technological explosion may take place that affects entire economic systems. (p. 20)

This description of change as it relates to technology, inventions, and productivity is thought to be understood by members of our society. Educators, however, have done little to convey the ideas or ramifications of change to their students. The future has been described as highly sophisticated, fast moving, and computer oriented. We are said to be moving from a goods-producing to a service-oriented society. Employers predict that individuals will soon have to be retrained more than once for new occupations. These descriptions of our society are not being conveyed to students in our educational instiutions who are supposedly being trained for the future. Michael (1973) noted that teaching the process of change as it relates to one's education requires that the teachers and students both should learn to:

1. Live with and acknowledge great uncertainty,
2. Embrace error,
3. Seek and accept ethical responsibilities for goal setting,
4. Evaluate the present in light of anticipated future,
5. Live with role stress and forego the satisfaction of stable, on-the-job, social group relationships, and
6. Be open to changes in commitments and directions. (p. 291)

The need for teaching Michael's ideas on change cannot be overstated, for the magnitude of change that will take place in the lives of most people as a result of the information available through world communication systems will be immense compared to history. Mead (1972) described the characteristics of individuals in today's and future societies as follows:

> Today, nowhere in the world are there elders who know what the children know, no matter how remote and simple the societies are in which the children live. In the past there were always some

> elders who knew more than any children in terms of their experience of having grown up within a cultural system. Today there are none. (p. 36)

Mead's work has gone mostly unrecognized by educators in schools. As early as 1970, the President's Commission on School Finance concluded that "the schools have emphasized the past, ignored the present, and to a great degree, eschewed the future" (p. 12). The need to address the future in education as related to values and technology was reported in a publication titled, *Industrial Arts Teacher Education Program in the Technologies* (1970). The report noted the following:

> A concern has been shown for an individual essential to the ultimate welfare of a future society. This individual must acquire a set of values which are closely aligned with the evidence now available as related to the society of tomorrow. The children of tomorrow will confront societal and technological problems which today are only speculative. Education must accept this as a challenge and redesign and redirect its emphasis to the solution of some long-range problems related to man as an individual. (pp. 20–21)

There is no known absolute system for indicating where change will lead. There have been, however, numerous indicators and methodologies developed to assist forecasters in determining the alternatives and consequences, both positive and negative, of change.

Keniston (1979) noted that "if there is any one fact that today unites all . . . in the world, it is adaptation to revolutionary change in every aspect of life in society, in values, in technology, in politics and even in the shape of the physical world" (p. 445). Keniston further noted that every index suggests that the rate of change will increase up to yet untested limits of human adaptability.

Munshi and Scheiber (1979), working in conjunction with Keniston, found that there is no single "source" for technological change. Each innovation results from interrelated factors, which result in technology affecting us as individuals and as members of society. Munshi and Scheiber found that "the systematic nature of technology means that if you tinker with one aspect, all kinds of results follow, many of them unexpected" (p. 58).

The Need for Planned Futures

The foregoing discussion has described characteristics of technology, values, change, and education as they relate to preparing individuals for the society in which they will live. There always remains a need for carefully and systematically planned futures based on information and meaningful judgments. Toffler (1971) noted that

> today as never before we need a multiplicity of visions, dreams, and prophecies—images of potential tomorrows. Before we can rationally decide which alternative pathways to choose, which cultural styles to pursue, we must first ascertain which are possible. Conjecture, speculation and the visionary view thus become as coldly practical a necessity as feet-on-the-floor realism was in an earlier time. (p. 463)

Toffler's thoughts are even more important today than when first written. One of the biggest challenges that education faces today involves preparing individuals to become meaningful contributors in a society characterized as having a knowledge explosion, change factors that will increase to yet untested limits, and problems that are corrected or created by technology. Educators have the challenge of producing individuals who are aware of the problems facing society and who have the background and understanding of technology to provide answers that will benefit society.

REVIEW OF THE LITERATURE

This section focuses on education as a fundamental tool for implementing social change, progress, and reform in society in addition to being a primary factor in educating individuals for their life in a technological world. The literature pertaining to these topics is voluminous. The following discussion is a summary of the many ideas written on these topics.

A Perspective of Education in the Technological Society of the Future

Through education, formal and informal, people learn to extract from the world that which is most relevant to their lives. The learner must be able to organize knowledge when possible, solve problems, and use every opportunity to apply that which is gained to one's existing situation. Hornbake (1980) wrote that education is the process that yields the cultured person. He defined the cultured person as one

> (1) who is adjusted to the environment in which he lives, (2) who is acquainted with the forces which influence his well-being, (3) who is eager to participate in controlling his own destiny, (4) who

> obtains from each experience an optimal meaning, and (5) who is able to make his way economically in a socially accepted manner. (p. 28)

Hornbake's description of a cultured person will not become dated, but rather will become adaptive to every generation and society. The criteria for being a cultured person will vary with time and location of the individual. What then is an appropriate education in a society characterized by fast-moving technological developments? Gorman (1972) noted that

> society changes have come so rapidly in our time that only the most socially, intellectually, and politically alert are able to comprehend even partially the consequent demands upon our institutions. (p. 565)

Gorman's remarks reflect the great pressures put on our educational systems as a result of the information/knowledge explosions that are evident in today's society. Mead was aware of these pressures when she wrote, "We must create models for adults who can teach their children not what to learn, but how to learn and not what they should be committed to, but the value of commitment" (p. 46). Bennis and Slater (1964) noted that parents are unable to define the parameters of the future for their children and thus cannot even establish the terms of possible change or a range of alternative outcomes. They further noted that parents feel useless and obsolete in a way rarely experienced by parents of any previous century. Their partial solution to educating individuals in the present society would be

> teaching how to live with ambiguity, to identify with the adaptive process, to make a virtue out of contingency, and to be self-directing—these will be the tasks of education, the goals of maturity and the achievement of the successful individual. (p. 53)

These prescriptions for educating members of our society do not offer easy solutions. The changing times have put educators in a position that requires the regrouping of resources, justifying their existence, and reorganizing efforts. Creating new directions in education is not an easy process and requires considerable work. The challenge is present, however, and requires a review of current situations and the planning of programs for optimum gains. New ways of applying learning theories to teaching strategies must be established. Many challenges exist that go beyond the walls of the classrooms.

A new generation of leaders must now be prepared to look at progress from a different viewpoint, for society's outlook on progress has changed. There was a time when all progress was viewed favorably.

Progress meant change and achievement. Those days have changed. Progress today is measured in its discontents as well as its achievements. For example, scientists have been successful at prolonging life spans, which has resulted in regional overpopulation and problems of the aged. Highly developed science and technology have produced hazards of mass destruction through nuclear and biological weapons. Advances in communication and transportation have increased noise and land pollution. Efficient production systems have led to the dehumanization of ordinary work (Cornish, 1977). The list of achievements and their secondary effects could go on endlessly. Educators have the task of preparing leaders to deal with such dimensions of progress and their results.

Educators are going through a time when thoughts relating to the future are filled with uncertainty and confusion. Learners are increasingly being called on to deal with an expansion of knowledge, with such learning not having to take place in the traditional school structure. Education will more frequently occur in industry, learning resources in libraries, computers, or any of a number of places. Structuring this learning will involve many problems. Changes in knowledge acquisition will dictate individually designed approaches and new interdisciplinary challenges. Practice will be required to provide efficiency in the different modes of instruction. Educators face the challenge of searching beyond their daily activities in a quest for efficiency in using new approaches while adding strength to the educational process of the learner.

Educators must be willing to think of tomorrow, consider events beyond the classroom and laboratories, include other disciplines in the educational process, and work with other interested educators in solving the many problems that face educational institutions. In an address to members of his College of Education, Corrigan (1977) suggested that educators examine the societal occurrences that affect education and try new approaches, study the successes of innovative approaches, and gain from the errors which accompany new methods. Corrigan further stated that educators must work with other people's children with the same intensity as they would work with their own.

Citizens in the U.S. need to be prepared to function effectively in a rapidly changing society. Schools and other educational institutions have an obligation to help people learn to live and cope effectively with change. The educational program should be continuously adapted and improved to meet emerging needs. Adelson (1973) noted that "a person must learn to extract from the world all that is most relevant to his life, to avail himself of the opportunities life offers, to avoid its dangers, and to deal with its situations as they arise" (p. 238).

Adelson suggested that the learner must be able to organize what they want to learn, enjoy knowledge whenever possible, and use it in formulating and solving problems.

A well-educated person in this society should be able to implement appropriate action whatever the situation. These actions must be performed in anticipation of events whose outcomes can be influenced by their own behavior. An individual must be able to improve his or her life situation and experience gains in their lives as a result of their own action. People must be educated to affect the world they live in, whether or not the changes are technological in nature.

The previous documentation has presented a perspective of education in the technological society of the future. Information pertaining to pressures on our educational system, coping with society, and the alternatives available to educators were presented. Finally, the discussion presented a brief perspective of the nature of an individual educator for the society of the future.

Measures of a Person's Education for the Future

The measures of one's education differ in conjunction with one's culture and the time in history in which one lives. The following discussion will briefly present the measures of a person's education in a society which is yet to come.

Benjamin (1947) in his book, *Under Their Own Command*, presented a series of four measures of a person's education. The areas were (a) measurement of insight, (b) measurement of drive, (c) measurement of efficiency, and (d) measurement of significance. Now, more than any other time in history, educators must strive to give students additional insight into the world they will live in, assist them in acquiring the drive to reach their potential, instill a sense of efficiency and purpose to their actions, and prepare them to make significant contributions to society.

Perhaps these measures of efficiency were easier to achieve in earlier historical stages when change was so slow that humans were usually able to cope with their evolution. Those times, however, have passed, and as Fabin (1968) stated, "We know how to increase production to almost any level we desire, but what we don't yet know is how to create a social, political and economic environment capable of contending with change." (p. 27) The measures of a person's education may be evaluated in terms of the understanding that he or she has of the ramifications of technology and how to apply those understandings. Fabin noted that

> the contention that persons ignorant of technology can function in a democracy to any effect when the society is a technological one

> is dubious. Understanding is not a prerequisite of control, it is control. (p. 27)

The post-industrial society, a current descriptor commonly used to describe life in the United States, requires a new measure of one's abilities. Bell (1973) elaborated on the nature of control in a high technological society when he compared the elements of control in the past, present, and the future. The measure of one's effectiveness in the pre-industrial, industrial, and post-industrial society were presented by Bell as follows:

> **Pre-Industrial Society:** Game against nature where resources are drawn from extractive industries and is subject to the laws of diminishing returns and low productivity.
> **Industrial Society:** Game against fabricated nature, centered on man-machine relationships and uses energy to transform the natural environment into a technical environment.
> **Post-Industrial Society:** Game between persons, a type of intellectual technology based on information rises along side of machine technology. (p. 116)

The measures of one's education may also be viewed in terms of the insight, drive, efficiency, and significance as applied to the individual's ability to function in a technological society. The nature of these measures of one's education have changed throughout history, evolving to what now may be considered an informational society in which those who have access and the ability to control information are those who are in control.

Learning How to Learn As a Life-Long Process

As the nature of society and new occupations evolves, the average worker will become more sophisticated in daily, on-the-job skills. Constant retraining will take place through educational programs to keep the working society updated with new practices. Workers will not always be required to be re-educated to keep their jobs, but they may lose their jobs if they fail to do so. The constant retraining of people for jobs will become a necessity for members of the working society. Thus, it will become necessary for individuals to learn how to learn to advance in their areas of expertise. Education will become a lifelong process, starting when the individual desires to learn and continuing until death. For many in our society, education will become a necessity, for automation and cybernation will force the upgrading of previously learned materials, thus adding to the sophistication of the common everyday job. Burton (1969) noted the relationship between education, technology, and its effect on the worker.

> Education will, and certainly must, be the process of preparing for lifelong learning and adjustment to an increasing complex and constantly changing environment. Modern technological advances will increase the amount of knowledge one must absorb. Technology will also increase our ability to handle vast amounts of new material and to utilize it effectively. (p. 149)

Burton's remarks regarding lifelong learning indicate that education must prepare one for life as technological advances increase the kind and quantity of knowledge that one must absorb. Technology will also increase our ability to handle vast amounts of knowledge. It now becomes important to teach how facts may be gathered rather than what the facts may be. Hayward (1971) supported the work of Burton when he wrote the following:

> The kind of people who emerge from education may be far more important than the exams they can or have passed. Educational planning authorities in a few places are interested in how to "produce" people who have a continuing motivation to learn, who have "learned how to learn," who have the capacity and inclination to work and live cooperatively with other people; people who have critical sense, lively curiosity and are "creative." (pp. 92–93)

The importance of people in education and the task of motivating the learner were of concern to Hayward as he addressed lifelong learning and learning how to learn. Others who have addressed and supported lifelong learning include Marien (1970), Janne (1970), Maley (1970), and Silberman (1970). Many others have endorsed this concept since these educators, as it has become increasingly evident that "learning how to learn" is a fact of life if one is to enter and progress in a given occupation. That a vast amount of knowledge will confront the learner in the future society equipped with computers, retrieval systems, and a knowledge explosion emphasizes the importance of the "learning how to learn" concept for education. Janne discussed the importance of information gathering and processing.

> The schooling of youth will be less and less a matter of acquiring knowledge (which soon becomes outdated) and information (provided more comprehensively elsewhere) but will be devoted rather to the acquisition of methods of thoughts: "adaptive" attitudes, critical reactions and disciplines which "teach how to learn." (p. 81)

Janne realized the importance of methods of thought, attitudes, reactions and disciplines that "teach how to learn." Education in a changing society, especially in a post-industrial society as characterized by Bell, must be structured to permit additional learning, be reflective of our technological society, and allow an individual capable of coping with the vast amounts of information available today and in the future societies.

CONTRIBUTIONS INDUSTRIAL ARTS CAN MAKE TO THE STUDY OF THE FUTURE

Many fascinating events lie ahead in education. The continuing tasks of education will be to produce individuals capable of being successful contributing members in their society/culture. These individuals must achieve a feeling of self-worth while participating in a complex, technological environment. Industrial arts education can make an important contribution to the overall education of an individual by (a) enhancing the quality characteristics of a healthy growing individual in a rapidly changing society, (b) providing experience/practice in applying technology in the solution of major problems facing society, and (c) serving as a vehicle for individuals to learn how to learn.

Enhancing Individual Quality Characteristics in a Rapidly Changing Society

In addition to increasing one's technological knowledge, industrial arts education is a part of a total education process of meaningful events that will enhance the quality characteristics of a healthy, growing individual in a rapidly changing society. The education of a successful individual in present and future societies will provide practice for many of the following characteristics, which will be enhanced by the educator. The listing is supplemented with descriptions illustrating how industrial arts is an important part of the educational process. Successful individuals will be able to do the following.

Learn information gathering techniques and develop the ability to use findings. Studying the future through industrial arts activities can be an exciting, relevant experience for students. Their motivation to learn can be enhanced because they will be seeking answers to questions that have relevance in the future. Students learn ways of finding information on such interest areas as laser writing, fission power, holography, underwater propulsion vehicles, deep sea storage, and floating cities. This information is accumulated through search processes using the computer, libraries, personal contacts, telephone, and knowledge gained from fellow students. The accumulated information can then be applied toward an industrial arts project construction activity, presentations to the class, displays, and the learner's overall knowledge about technology. At the same time, the individual student learns much about the technology areas being searched by other members of the group/class.

Organize knowledge and enjoy lifelong learning. Knowledge learned about a specific technological topic, such as refinements in solar housing, must be organized by the learner in such a way that a meaningful construction activity will result from the research findings. The student will have to review the possible refinements in solar housing, select the area of specific interest to him or her, develop plans of the construction activity, make presentations on the topic to other members of the class or community, and possibly produce a report on work completed. Achieving success in this process will give the student practice in organizing knowledge and experience to enjoy finding out about topics of interest that may be used throughout life.

Acquaint themselves with forces that influence their own well-being. There are many facets of life that seem to overwhelm members of society because of the sophistication of information and communication processes as well as advanced technology that is beyond any one person's capability. Therefore, it is necessary to enable individuals to develop an understanding of how to study a particular topic of interest and gain knowledge that will increase their technological awareness. Learning how to gather information, organize it for use, and then using it for advancement is an important step toward controlling one's well-being. This can be achieved in industrial arts through a study of technology, with the learner internalizing information on a technological topic, planning and designing a construction activity, and reporting the significance of the work to other individuals. Learning how to study about technology and gaining knowledge about a particular technological topic can be of much value to individuals acquainting themselves with the forces that affect their own well-being.

Identify with adaptive processes and anticipate events. The very process of studying future types of technology in industrial arts causes the student to identify with changing processes and anticipate events. An industrial arts student who has gathered information and studied materials relating to tidal power, for example, will naturally anticipate its use by developers during the coming years. The construction of a project/product by the student relating to tidal power will also allow the student to internalize many of the ramifications of this power source. Therefore, industrial arts used as a study of the future of technology can prepare students for their future by placing them in the middle of processes that are currently being adapted for use in society while allowing them to anticipate future uses of their areas of interest.

Formulate and solve problems by applying knowledge to existing parameters. Almost every phase of one's education can be considered as a problem-solving experience. A learning experience in industrial arts is loaded with problem-solving situations, starting with a question such as, "How can communication systems be used most effectively?" If a group of industrial arts students chooses this area as their interest, they will immediately have to decide where to gather information, how to organize their thoughts, what type of project and plans to develop, what tools and materials to use, how to organize their work for discussing it with others, and why this area is so important to humankind. These are only a few of the many problems the students will encounter. All must be practically applied to classwork that involves facts, attitudes, and skills of the student, teacher, and many members of society.

Seek and accept ethical responsibilities for goal setting through a self-directing process. The industrial arts students who have a part in choosing the area of technology that interests them for study and can set the direction for their research and construction activities are a part of a goal setting process for themselves. This can be achieved under the guidance of the instructor. The work becomes the students' responsibility, with much of the success of the research depending on the directions and goals that the students have set for themselves with the help of the instructor. Practice with the seeking and acceptance of ethical responsibilities does much to assist the students' development as responsible citizens contributing to the betterment of society.

Deal with dimensions of progress and their results. A student studying forms of global communications or the use of large scale fuel cells cannot help but become aware of the progress that has been made to date with the particular innovation. At the same time, the student also becomes aware of other types of technology that fellow students are researching. The development of the basic understanding of the student's interest area may then be continued throughout the individual's life as new developments are learned. Industrial arts students studying future technology have learned to deal with the dimensions of progress and their results. These results also add an extra dimension to the learner's education in that they can have either positive or negative consequences on members of society.

Adjust to the complex and constantly changing technological environment. No amount of education will prepare the average member of our society to become completely aware of the sophisticated technological environment in which we live. The knowledge gained from studying various aspects of the technological environment, however, can be the starting point from which an individual can begin to understand the complexity of society and gain a new perspective of the ever-changing environment. This renewing process is never ending, and it should be, in a society characterized by constant technological progress and changes.

Work and live cooperatively with other people. The interpersonal relationships that people develop with others serve as a guide to their success in a given occupation and life. Industrial arts experiences relating to the future of our society provide a forum for the learner to see how technology causes people to live in new relationships to other people. The same can be said for the relationships of nations as the different countries must learn to work with each other because of need for raw materials, goods, and services. Students in the classroom are also involved in experiences that cause them to work cooperatively with other individuals sharing common information, assisting one another in their research and construction, and working in selected group situations while experiencing as much role playing as possible as a member of a company working to produce a product or as a member of a design team. An experience of working in an industrial arts classroom studying the future is more than just completing a project. It is an experience designed to prepare the whole individual for working and living cooperatively with other people to achieve common goals.

Live with and acknowledge uncertainty and ambiguity. Industrial arts students studying technology and the future gain a level of technological literacy that will aid them in exploring their future. The study of the future of anything quickly provides the experience of working with uncertainties and ambiguities. Learning to deal with inexact circumstances, as students do in the future-oriented industrial arts class, is one major step toward assisting in the acknowledgment of and learning to live with that which has not yet occurred.

Gain optimal meaning from an experience. Traditionally, industrial arts has been known as a course in woodshop, metalshop, or drafting. A contemporary course in industrial arts that is focused on technological happenings of today and the future can give many of the same experiences to the learner that were in the traditional courses in addition to opening up a new perspective about the world in which they live. An industrial arts course designed to study the future allows for construction activities using many types of materials; gives opportunity to design, draw, and plan; and creates an added dimension to the basic experience of researching, reporting, and developing ideas about how technology can be used in solving societal problems. This additional dimension gives optimal meaning to the industrial arts experience, allowing students to explore the future in which they will live.

Industrial arts programs can provide experiences that lead to the healthy development of individuals who can make a significant contribution to society. Although the future holds many yet unknown events that will affect everyone's life, many characteristics related to learning will remain the same.

Applying Technology in the Solution of Societal Problems

Industrial arts can provide experience and practice in applying technology in the solution of major problems facing society. In the students' quest to learn how to control their environment, an awareness of the major societal problems existing today may be examined. The following questions could be considered by industrial arts students in a future oriented program.

—How can air, land, and water pollution be controlled in an increasingly industrialized society?
—What forms of housing will be needed for this planet and others during the coming years?
—What forms of power generation will be most appropriate?
—What conservation and resource use methods need to be applied?
—How can we make our transportation systems more effective for ground, sea, air, and interplanetary travel?
—What new processes will be used by industry to increase productivity and the quality of work life for the individual?
—How can communication systems be used most effectively?

These are only a few of the many questions that may be considered by industrial arts students. Each of these questions may be approached through an examination of the many alternatives being experimented with today. Industrial arts can contribute to the education of an individual toward his or her future by having one major thrust: *to explore the application of technology in the solution of major problems facing humankind.*

Industrial arts can form a partnership with society in an effort to develop people sensitive to and knowledgeable about the alternatives that are available in the problem areas of energy, pollution, transportation, housing, and so forth. Construction, design, and planning activities will be as vital as ever in producing an activity and product which will have technological and social relevance in the life of the student/learner. The instructional organization could center around procedures, such as those given below.

1. **The group project,** in which the total class or a major part of it would form a project management team to make a study of one major component of a problem area. The construction would involve making a reasonably sized model or in selected situations producing a working product depicting such projects as

   —coal gassification.
   —nuclear energy use.
   —development and/or use of solar energy.
   —hydroelectric units.
   —sea water desalination.
   —new space shuttle procedures.
   —satellite communication procedures.
   —pollution control technology.
   —coal extraction systems.
   —geothermal energy processes.
   —space manufacturing techniques.
   —community or urban planning.
   —trash and waste use.

2. **The unit approach,** in which the total class would elect to explore the alternatives to one or more of the problem areas. Some sample class units would include the following:
   A. The development and application of alternative energy sources. (This would be a unit topic.) Subtopics selected by the individual students might include

      —solar energy development.
      —energy through wind power.
      —artificial gas from waste.
      —nuclear fission development.
      —plant and agricultural energy sources.
      —hydroelectric power generation.
      —synthetic fuel development.
      —waste use energy development.
      (A model or some form of construction would be made by the students.)

   B. The development of alternative transportation systems and their application to current and future problems of society.
   C. The development of alternative water sources and their use in the current and future society.
   D. The development of alternative pollution control technology and their application to current and future problems.

3. **The research and experimentation or research and development procedure,** which permits each individual student the opportunity to investigate in depth the area of interest to him or her. Activities would include actual student research in such areas as

   —home (heat and cold) insulation materials (consumer/energy).
   —home (noise or sound) insulation materials (consumer).
   —solar energy use (energy).
   —air resistance studies (energy).
   —water resistance studies (energy).
   —pollution control devices (pollution).
   —wind-vane development (energy).
   —water purification (resource development).
   —structural component design (consumer/resources).
   —product comparisons (consumer/energy).
   —process comparisons (production/energy/consumer).

4. **The community involvement model,** in which the class or individual students make extensive use of the community as the principal source or location for their involvement with one or more of the problem areas.

Some specific examples under each of this form of organization are

—pollution control measures.
—soil and land erosion.
—transportation designs.
—trash use.
—water purification.
—water development.
—city or community planning.
—energy conservation efforts.
—trash and waste disposal.
—housing development and regulation.

Again, it must be emphasized that the foregoing alternatives are only abbreviated lists of technological happenings that can be studied in the industrial arts classroom. The selection of methodology and student projects are based on student interest under the guidance of the teacher. The nature of the projects/products depend on the students' ability and resourcefulness.

Many of these technological developments are reminders of the kinds of events popularized by science fiction writers. But just as yesterday's scientific fantasies have become today's realities, today's experiments may lead to important discoveries tomorrow. Students in industrial arts profit by gaining insight into forms of technology that may be an important part of their existence in the future.

Serving As a Vehicle for Learning How To Learn

The previous discussion has shown how industrial arts programs provide a vehicle for the student in making decisions about various forms of future technology. This vehicle or methodology enables the industrial arts student to develop skills in learning how to learn. The ability to learn may be used throughout one's lifetime resulting in a methodology for lifelong learning. This methodology, combined with the many elements of present industrial arts programs, provides an important and innovative educational experience. The development of manipulative skills and problem-solving techniques can also be an important part of the study of the future. Students may become acquainted with the seemingly endless number of materials and their uses in society. Opportunities are available to solve problems through the use of these materials in practical situations.

There are many more methodology characteristics that are a part of instruction in industrial arts while studying the future. Methods may be used to seek answers to questions of a technological nature while providing a means of completing construction (laboratory) activities. The traditional methods of communicating with a class (e.g., lectures, demonstrations, and discussions) are used. Activities in addition to those already used in the previous examples include line production, research-experimentation, scenario building, and simulating and gaming. All allow for construction activities while concentrating on specific topics related to technology and the future.

A major step in the process of implementing future studies depends on the type of methodology chosen by the teacher. Teacher-led discussions may help to develop a learning readiness for studying the future. The methodology may be chosen with the assistance of the students. If individual projects are going to be constructed by each student, then a direction has to be established as to what is to be studied. For example, the class may choose to study problems associated with transportation. Students would then pick individual problems related to transportation and develop their projects around that theme. A research and experimentation methodology may be chosen in which each student would then consider procedures for testing and experimenting in relation to a selected technology.

On the other hand, group-oriented activities may be used for conducting the learning process. One example of a group project related to housing would be a solar-heated building. Or, a class could construct lunar transportation vehicles. Scenarios may be developed suggesting an outline from which a class could produce a course of action requiring construction activities. Gaming and simulation techniques may be used to simulate group process procedures. These techniques require value clarification, role playing, discussions, and debating. They lend themselves to solving or help in understanding difficult and unfamiliar problems.

The methodologies and construction activities are used in a manner that allows for a new direction in studying technology. The nature of project construction is also different from the type of projects normally thought to be developed in an industrial arts setting. The construction activities require the same manipulative skills that are common in many other programs but are used toward a different type of project—one that will have some significance either technically, scientifically, sociologically, or economically in the future life of the student. Various materials, tools, or machines may be used in this approach, for the students are engaged in project construction that meets their own interests and ability level. And, instruction is given on laboratory tools and equipment when the need arises, allowing the instructor to emphasize such qualities as function, design, or craftsmanship.

When reviewing the educational principles that are put into practice while studying the future in industrial arts programs, students develop the ability to *learn how to learn*. Through the assistance of the teacher, fellow students, and other resource personnel, the student learns sources of information, how to acquire the information, and how to put the acquired materials into a project construction activity. Along with learning how to learn, the students develop social skills that may be used for lifelong learning (e.g., letter writing, making phone calls, research, and presenting materials to others). Research and construction activities are individualized. Since each student is allowed to choose a project of personal interest, each student may perform or be challenged at his or her own ability level without being held back or left behind by the rest of the class. At the same time, the exceptionally bright student is not limited by the rest of the class or by the teacher's knowledge. Industrial arts programs can incorporate many of the more important concepts in learning through the study of the future.

Industrial arts programs that deal with industry, technology, and the future can help the student consider the known to the unknown. For as Mumford (1973) wrote,

> In passing from the past to the future, we pass from memory and reflection to observation and current practice and thence to anticipation and prediction. As usually conceived, this is a movement from the known to the unknown, from the probable to the possible, from the domain of necessity to the open realm of choice. (p. 474)

Industrial arts education provides an opportunity for students to incorporate past and current practices with the anticipation of the possible alternatives that may be used in the years ahead. Through industrial arts education for the future, individuals may be prepared for an even more efficient, interesting, and exciting technological society.

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Chapter 14

Industrial Arts Puts the Whole Student in the School

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The final part of this series of discussions presents the processes of human involvement through which the contributions of industrial arts take place and achieve reality. The significance of the content, methodology, and the physical setting in which industrial arts is conducted is emphasized in relation to the student's sensory system functioning, psychomotor activities, human development processes, intellectual functioning, and personal-emotional involvement. Each of these play an important role in the preceding discussions dealing with the disadvantaged, the gifted, the handicapped, and the elementary school child.

Toffler (1974) highlighted the importance of greater involvement of the student in the learning process:

> Education . . . is not just something that happens in the head. It involves our muscles, our senses, our hormonal defenses, our total biochemistry. Nor does it occur solely within the individual. Education springs from the interplay between the individual and the environment. (p. 13)

The very nature of this chapter's title raises several interesting questions and potentialities for an area such as industrial arts.

To set the framework for the following discussion, propositions have been established that will set the conceptual dimensions of the presentation.

1. The nature of learning involves a range of interrelated factors and elements that interface with and depend on a variety of human processes.
2. The industrial arts activity is based on the idea that the learner is involved in an experience that is multisensory. As such, it has the potential for the learner to use the senses of smell, taste, touch, sight, and hearing.
3. The industrial arts activity has a rich potential for a strong intellectual involvement in such functions as creating, analyzing, assimilating, and perceiving.
4. The industrial arts activity has the potential for a deep personal involvement as such experiences deal with the learner's interests, likes, aspirations, curiosities, motivations, dreams, emotions, values, cares, satisfactions, and fears.
5. The industrial arts activity has great potential for the learner's involvement in the motor functions that relate to fine muscle control, large muscle control, and the coordination of the physical and mental capabilities.
6. There are strong connections between the motor activities and the intellectual factors of creating, analyzing, assimilating, and perceiving. These same potentials for connections exist between the personal and the motor.
7. The industrial arts activity provides a rich arena for the student to engage in learning experiences directed toward the achievement of developmental tasks at the several levels or growth periods.
8. The wholeness of the educational and growth processes for the learner is based on the concept that the intellectual, personal, motor, and developmental task factors are dependent on one another.
9. The dimensions of wholeness in an educational sense for the individual is achieved when the learning process maximizes the human potential for involvement in that process. That is to say, if one can learn about the properties of wood through the senses of smell and touch, and there is no opportunity to use those senses in the learning experience, then the concept of wholeness is not fulfilled.

10. The flexibility of the program and comprehensiveness of its structure and a creative, imaginative, effective teacher are essential to the process of educating the whole child.

The following discussion will elaborate on these propositions. Five must be considered individually and collectively to put the whole student in school. These are

1. the sensory system for seeing, hearing, smelling, tasting, and touching.
2. the physical motor control and the coordination of the mental, biological, and physical units within the individual.
3. the psychological, emotional, and personality factors related to the learning process.
4. the developmental tasks of the learner.
5. the development and integration of global strategies that provide for a maximum involvement design.

Figure 14-1 on page 250 illustrates the concept of wholeness that will be elaborated on in the sections that follow. This figure portrays the learner as "The Student Incorporated," with all communications passing through a multisensory system. All of the components are linked directly and indirectly in the "person"-incorporated concept.

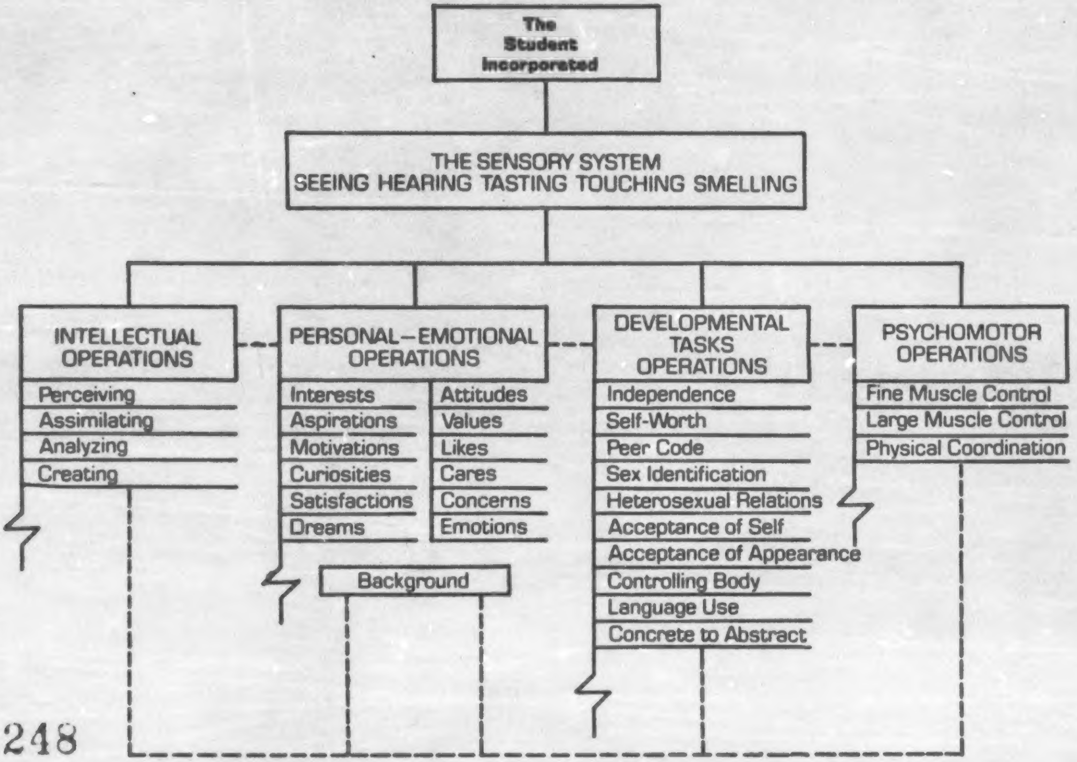
The Sensory System. The "whole-person" concept must deal with that important dimension that involves the sensory system through which the individual is able to receive messages and stimuli from people and things in the environment. This multisensory system consists of the senses of smell, taste, touch, sight, and hearing. The importance of their consideration in this discussion of the whole learner is based on a principle in education that states that the degree to which an individual can learn about anything depends on the use of all of the senses that can be brought to bear on that subject.

Much of what is done in the industrial arts laboratory is a multisensory involvement on the part of the learner. This normally includes the sensory involvement of the eyes, nose, ears, and hands.

As an example, the turning of a piece of wood in a lathe provides the learner with such sensory input as

- hearing the lathe operate.
- hearing the tool cut into the wood.
- hearing the differences in sounds caused by different tools or speeds.
- hearing the sounds from different woods.

Figure 14–1.


The Student Incorporated
THE SENSORY SYSTEM
SEEING HEARING TASTING TOUCHING SMELLING
INTELLECTUAL OPERATIONS
Perceiving
Assimilating
Analyzing
Creating
PERSONAL–EMOTIONAL OPERATIONS
Interests
Aspirations
Motivations
Curiosities
Satisfactions
Dreams
Attitudes
Values
Likes
Cares
Concerns
Emotions
Background
DEVELOPMENTAL TASKS OPERATIONS
Independence
Self-Worth
Peer Code
Sex Identification
Heterosexual Relations
Acceptance of Self
Acceptance of Appearance
Controlling Body
Language Use
Concrete to Abstract
PSYCHOMOTOR OPERATIONS
Fine Muscle Control
Large Muscle Control
Physical Coordination

- hearing differences in sounds due to the mounting or construction of the lathe.
- seeing the tool enter into the wood.
- seeing the chips come off the wood.
- seeing the nature of chips or cuttings.
- seeing the differences caused by various turning tools.
- seeing the differences caused by different cutting speeds.
- smelling the odor of the wood chips.
- smelling the odor of the equipment.
- smelling the odor caused by a nonlubricated tail stock center.
- touching when applying the tools to the wood stock.
- touching or feeling the turned stock (after stopping the machine).
- feeling the vibrations in the machine at different speeds.
- feeling the variations in tool control from rough to finish turning.
- feeling the force needed to control the tool.

(The sense of taste in this example has not been included for obvious reasons.)

These are just some of the ways in which the various senses serve the student in the wood turning operation. However, much of this communication can only happen (in the most realistic sense) by having the student experience such phenomena on a first-hand basis. For example, the sense of touch under these conditions cannot be described in words or pictures; the odor of the fresh turned wood cannot be described in words with any degree of commonality of understanding; or the force required to hold and guide the various tools into the wood cannot be communicated by words.

What might be even more significant is the sensory perception that the student has when the senses of touch, sight, smell, and hearing are functioning as a series of integrated inputs into the mind of the student. The "whole" person becomes a part of the process and the resultant learning is organismic in its impact on the learner because it involves several of the major sensory systems in a coordinated, overlapping design.

The idea might be carried one step further by asking the question, "What would be lost in the student's learning if there was no physical involvement with the tools, materials, or equipment and the learning process involved only a reading assignment or a lecture on woodturning?" This is another part of the case for industrial arts in the education of the individual through the involvement of the whole person.

Let us now take that same example of woodturning on a lathe and move it beyond the sensory inputs or sensory perceptions that contribute to one's knowledge from the turning of a piece of wood. The experience of performing such an operation has the potential for deeper personal dynamics, such as having the student

- observe the power one has over materials associated with the environment.
- observe the control one has over the equipment and its operation.
- explore one's creative or artistic talents in the variations of turning designs that are possible.
- explore one's interests in wood, wood shaping, and its potential applications.
- produce an object of value to himself or herself.
- achieve status in his or her peer group for performance on the lathe.
- explore one's interest in working with wood as a vocation or avocation.

These additional, deeper personal outcomes are possible or at least greatly enhanced by the whole-person involvement in such first-hand, multisensory experiences. Industrial arts, in its design for putting the "whole" student into the educational process, makes deeper, more concrete learning possible. It is, in fact, a living-learning involvement with the materials, products, and processes of industry and technology.

Physical Motor Involvement. Education has traditionally been of the mind. The mind is the principal repository of all past experiences and functions as the principal control and integration center for much of one's intellectual activity. Thus, the processes of education have tended to treat the mind's development in isolation from its dependence on the other components of the human. Much of this development of the mind has been attempted through the use of symbols in a secondhand and abstract manner. It also has been attended by learning in a passive participation mode.

This preoccupation of mind development has limited the concern on the part of educators for the broader dimensions of how the mind gains access to stimuli that can have a great impact on the quantity and quality of learning. It is here where the industrial arts experience can provide new dimensions of intellectual development. The potential for action learning and the implementation of kinesthetically involved processes become major sources of intellectual substance that cannot be achieved by the most clever of abstract symbols.

Let us take a simple example of communications to the mind, which illustrates the functioning of the passive-symbol learning and then the nature of input by action or kinesthetic stimuli.

Example A: The label on a sack of cement contains the wording: "Net weight 25 pounds."

The message to the mind is related to the figure *25*. Is that heavy, or is it light? The answers to these questions remain a mystery because the system of communication does not answer those questions. Even if the symbols contained the notation, "Net weight 25 pounds—heavy," what more does the learner have than to believe or remember that the net weight was 25 pounds and is labeled "heavy." The word *heavy* has no real meaning because such a term is relative to the strength capability of the person to whom it is directed. The message to the mind in this case has come through a second-hand process.

Example B: The individual sees the label on the sack of cement: "Net weight 25 pounds—heavy."

In this case, however, the person goes beyond the written symbols and their "perception" to him or her. The person engages in action learning with kinesthetic involvement and proceeds to lift the sack of cement. It is at that point that the person gains a perception of the strength required to lift 25 pounds (in a sack), a perception of the relationship between him- or herself and such a weight, and a perception of what society has chosen to identify as 25 pounds or heavy. This is a form of action learning. It is also a first-hand experience.

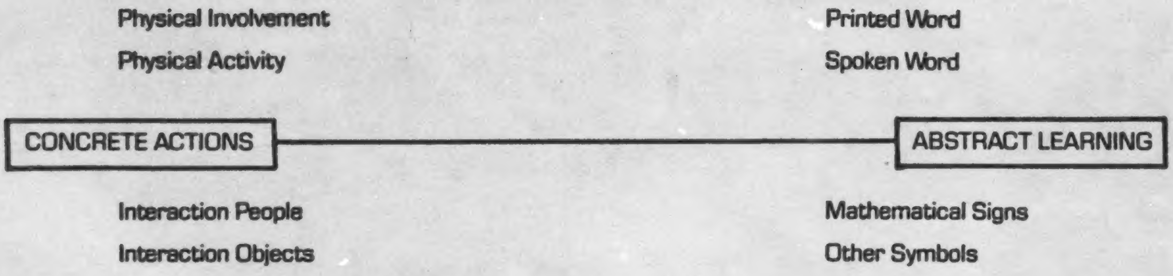
Perhaps one might want to examine the effectiveness of these two systems; that is, the active versus the passive, or the first-hand versus the second-hand. Figure 14-2 on page 254 shows a continuum in learning experience as the process moves from the concrete to the abstract or the abstract to the concrete.

Whitehead (1952) discussed the differences between these two systems of learning.

> First-hand knowledge is the ultimate basis of intellectual life. . . . What the learned world tends to offer is one second-hand scrap of information illustrating ideas derived from another second-hand scrap of information. The second-handedness of the learned world is the secret of its mediocrity. (p. 61)

One might take that example and rationalize that the context of "25 pounds net weight—heavy," is of no intellectual consequence.

Figure 14–2
The Learning Spectrum


Physical Involvement
Physical Activity
Printed Word
Spoken Word
CONCRETE ACTIONS
ABSTRACT LEARNING
Interaction People
Interaction Objects
Mathematical Signs
Other Symbols

> *It is only through such learning experiences (Industrial Arts) that the potential for action learning styles can be identified as within the repertoire of learning of any individual. . . .*
> Lloyd Nielsen

Such an inference is to miss the point. The issue is one of a process of how practically all humans learn. It is also an issue of the quality of the learning and the accuracy of the meaning attached.

The secret of action-learning effectiveness at the higher or lower domains of intellectual activity is essentially one of the nature and quality of the action learning experience. Much will also depend on the inferences and generalizations that grow out of the action or kinesthetically inspired experience. The teacher of industrial arts plays a major role in such learning experience design.

To examine the role of industrial arts in this broad arena of action learning in association with the kinesthetic, we must go beyond the issue of fine or large muscle control and coordination. The end sensory organs located in muscles, joints, and tendons that are activated by physical movement or contact with other elements are a part of the system. Not only is there a manipulative and coordinative capability, there is also the sensory communication process which serves as a prime source of mental enrichment.

A few examples out of an endless number of potential items might be useful in this discussion. The kinesthetic involvement may provide communication to the mind about such items as

- the hardness or softness of materials.
- the difficulty to move, lift, or release items.
- the texture of materials.
- the pliability of certain materials.
- the consistency of materials.
- the weight of items.
- the relative differences in weight, consistency, and texture of materials.
- the ease or difficulty of working with various materials.
- the power one has over materials, objects, and equipment.
- the sensitivity of selected functions or operations.
- the tiring nature of some tasks.
- the level of coordination required.
- the ease of certain tasks through the use of levers and other forms of mechanical advantage.

The list of such physical-kinesthetically involved sense perceptions through industrial arts could fill many more pages. But, what is also important is the quality and accuracy of the perception that results from such first-hand interaction with the products, processes, and materials of industry and the world beyond the self.

The physical contact needs of the individual were stressed by Illich (1973-74).

> If a person is to grow up he needs, first of all, access to things, to places and processes, to events and to records. He needs to see, to touch, to tinker with, to grasp whatever there is in a meaningful setting. (p. 121)

Action learning frequently involves the whole person in most, if not all, of his or her learning processes. The actual construction of an object from wood, metal, or other material can be a total involvement process wherein the physical-motor, the intellectual, and the personal-emotional interact as a coordinated unit. As a result of such constructional activity, there is the potential for mental, physical-motor, and emotional growth on the part of the learner.

Action learning does not necessarily imply the need for making a project. The development of one's ability to lead others is greatly enhanced by actually having the opportunity to lead and practice leading under the direction of a skillful teacher. The same may be said for designing, problem-solving, researching, planning, and inquiring. Each of these can be strengthened through the active involvement and practice in such experiences in a lifelike and meaningful setting. Action learning in each of these instances is vital. Of course the teacher's role and the nature of the program will play important parts in the process of such development.

It would be helpful if the industrial arts laboratory were visualized and used not as a shop to make things, but as a laboratory of diverse facilities associated with life, industry, and technology; and that the function of such a facility was to serve as a living-learning environment for the development of the total person, not just the psychomotor, the affective, or the cognitive, but all of these.

The Psychological-Emotional Matrix. There is another system at work in every student that has relevance to this discussion of the total learner involvement. It functions in all areas of education and has a particular relationship to industrial arts. This is the complex psychological matrix related to the emotional and personality factors of the person. These factors include such phenomena as curiosities, interests, motivations, likes, dislikes, fears, drives, aspirations, values, and sensitivities.

The students who enter the classroom or laboratory come equipped with all of these, but never in the same quantity or quality. This is an acute area of individual differences that must be reckoned with if the whole person is to be put into the school. Cantor (1961) provided a good description of the circumstances for many students.

> The pre-adolescent and adolescent find themselves in high school. How little the average high school teachers appreciate the nature of the real problems of their pupils! The teachers want "to train the mind," fill it with ideas and facts by means of lessons to be "learned." The pupils "take it" and return it. Their curiosities, confusions, imaginations, loves, and hates, with regard to themselves, their parents and others, belong in a world almost totally ignored by the school. Their real problems remain more or less concealed. (p. 92)

The degree to which a program reaches the student, makes the appropriate connections. or establishes relevance is in a large measure related to the compatability or the harmony of the relationships that can be established with these sensitive human factors.

The obvious key to this relationship is the diversity and dimension of experiences available to the student to make the necessary linkages. Also, it is the diversity and dimension of experiences that will provide for increasing the number of "total" student involvements that take place in the program.

An example is a narrow, limited activity program that requires all students to do the same things. A program of limited scope is strongly affected by teacher domination, leaves very little opportunity for student interests, motivations, likes, or values. Thus, without these important connections, the vital human mechanisms that energize the system are not permitted to function in support of the teaching learning process.

There are several forms of industrial arts experiences that have potential for a broad spectrum of choices, interests, motivations, likes, values, and curiosity for the student because of the range of student activity structured into each. These include

- broad gauge anthropological unit studies.
- broad gauge contemporary unit studies.
- broad gauge futuristic unit studies.
- comprehensive group project involvement.
- broad gauge research and experimentation programs.

Each of these has the potential for dealing with the issues of relevance and striking a harmonic relationship with the various complex psychological factors previously listed. If, on the other hand, the program does any of the following, the whole body may be present but the whole person is not participating:

- discourages curiosity, interest, or aspirations.
- is based on teacher or narrowly conceived interests.

- does not allow for student likes or concerns.
- is not geared to the individual's motivations.

Any discussion of putting the whole boy or girl in the school must give some concern to student background. This includes all dimensions in the individual's past that in some way influence the nature of the present being. This would include one's ethnic, religious, educational, cultural, economic, social, and political background.

The realities of the background factors are readily discernible as one examines the differences in students as manifested through their habits, aspirations, insecurities, motivations, manners, dress, language, ideas, values, and sensitivities.

An awareness of the background factors may be of considerable help to the teacher in his or her attempt to reach or involve a student. The effective teacher attempts in various ways to establish the connections or linkages between the individual's background and the activities in the class or laboratory.

Saylor (1973) identified an extensive list of background factors that tend to shape the development of the individual.

> From the standpoint of the student, primary consideration must be given to his or her capabilities and potentialities, motivations, aspirations, self-concepts, status of personal, intellectual, emotional, and social development, interests, "hangups," the nature and character of the family or foster family and peer group relationships and not eliminate the whole gamut of similar characteristics that shape the development of the individual. (p. 42)

Student Development Concern. Another element in establishing educational programs for the whole child or student is what has been identified as the developmental tasks of an individual. Havighurst (1953) describes such tasks as follows:

> A developmental task is a task which arises at or about a certain period in the life of an individual, successful achievement of which leads to his happiness and to success with later tasks, while failure leads to unhappiness in the individual, disapproval by the society, and difficulty with later tasks. (p. 2)

The concern in this centers around the personal nature of the program and how it helps the student pursue, with some degree of effectiveness, the particular tasks that he or she is attempting to achieve during that period in life. The importance of such tasks in the lives of the students merits consideration in this discussion of putting the whole individual in the school.

Developmental tasks have been identified for the various growth stages of the individual; early childhood, late childhood, early adolescence, and late adolescence. For example, Tryon and Lilienthal (1950) identified the following developmental tasks for early adolescence.

1. Establishing one's independence from adults in all areas of behaviors.
2. Accepting one's self as a worthwhile person, really worthy of love.
3. Behaving according to a shifting peer code.
4. Strong identification with one's own sex mates.
5. Learning one's role in heterosexual relationships.
6. Reorganizing one's thoughts and feelings about one's self in the face of significant bodily changes and their concomitants.
7. Accepting the reality of one's appearance.
8. Controlling and using a new body.
9. Using language to express and to clarify more complex concepts.
10. Moving from the concrete to the abstract and applying general principles to the particular. (pp. 84–87)

The so-called "whole person" during the period of early adolescence comes into the laboratory or classroom as a physical, biological, and emotional being and also as one who is striving to achieve the particular tasks of importance to him or her at that time. If the program is to deal effectively with the whole person, it must make provision for the individual to establish independence from adults, accept one's self as a worthy person, control and use a new body, use language to express and clarify more complex concepts, and so forth.

The indifference of teachers and programs to such personal needs for achievement simply implies that one can "educate" the person without any attempt to coordinate the processes and content with the principal concerns of the individual. Such neglect has been a factor in school discipline as well as parent-child problems. Crow and Crow (1954) expressed concern for the growth and development of the student and its importance to the educator.

> School men and women must take cognizance not only of the fact that the potential learner consists of brain or even of brawn, or both, but the fact that he is a complex of phases of growth and development which may or may not follow the same or a similar rate of development. (pp. 129–130)

The industrial arts program—with its great potential for flexibility, diversity, and adaptability to student needs—is indeed a part of the educational system where the physical, emotional, and societal growth needs of the individual can be fulfilled. This, of course, requires sensitive, creative, and pupil-centered teachers with a sense of education that starts with students and what they are trying to accomplish.

Maximum Involvement Design. The wholeness of the individual's involvement in the educational experience is dependent on the completeness or global quality of the learning experience design. This refers to the degree to which educational strategies are selected for their potential for providing optimum involvement in the program or educational design. The concern in this area is that much of what goes on in the public school may be classified as passive or minimal involvement with the substances of the programs.

To illustrate this concept, a series of strategies for teaching or learning follows:

Strategy A	involves listening to a lecture or an audiotape.
Strategy B	involves the reading of a text or other written material.
Strategy C	involves watching and listening to a television or motion picture presentation.
Strategy D	involves watching and hearing an actual live demonstration.
Strategy E	involves performing a task or operation under controlled or simulated conditions.
Strategy F	involves performing the task or operation under actual working conditions and with major responsibility for its effectiveness.

Each of the above deals with a different level or dimension of the communication/learning process. It represents a continuum in range from second-handedness of education to that which might be referred to as first-handed. This is not to imply that reading, listening, or observing are undesirable. They are extremely valuable in the contemporary age as a means of trying to keep abreast of events. The concern here is one of the degree of total involvement for optimum learning, and how educational strategies can be designed or integrated to meet that concern. The industrial arts program has an obvious potential for using all such strategies.

On the other hand, it is obvious that a great deal of education is conducted using Strategy A (listening) and/or Strategy B (reading). Instruction by such strategies might just as well be conducted with the student staying at home, reading the text, and listening to the radio or an audiotape. It is quite obvious that the in-school instruction of this type does not involve the whole person.

However, if we join strategies A (listening), B (reading), C or D (watching/listening), E (performing), and F (performing under actual conditions), it is apparent that a more global or complete process of learning involvement has taken place. This is the case that can be made for industrial arts. It has the potential for an integrated strategy system that extends across the various teaching-learning processes by which the total individual gets put into the instructional scheme.

To move this discussion of strategy design and use one step further, let us take an actual example of an integrated strategy involvement in the learning process as might be carried out in industrial arts.

Goal: The student will develop an understanding of contemporary industry in terms of its organization, materials, products, processes, and personnel, as well as the problems and contributions resulting from such industry. A series of specific objectives could be developed in relation to the above goal.

A second goal with a series of objectives could be developed that would relate to the human competencies of learning, inquiring, and problem solving. Other goals and objectives might be stated in keeping with the thrust of the program. Now, let us look at the range of involvement strategies again with special reference to the previously stated goal.

Strategy A: listening involvement. Students are involved in listening to a lecture by the teacher, or a tape recording of a presentation, on line production in contemporary industry.

Strategy B: reading involvement. Students are involved in reading about line production in contemporary industry.

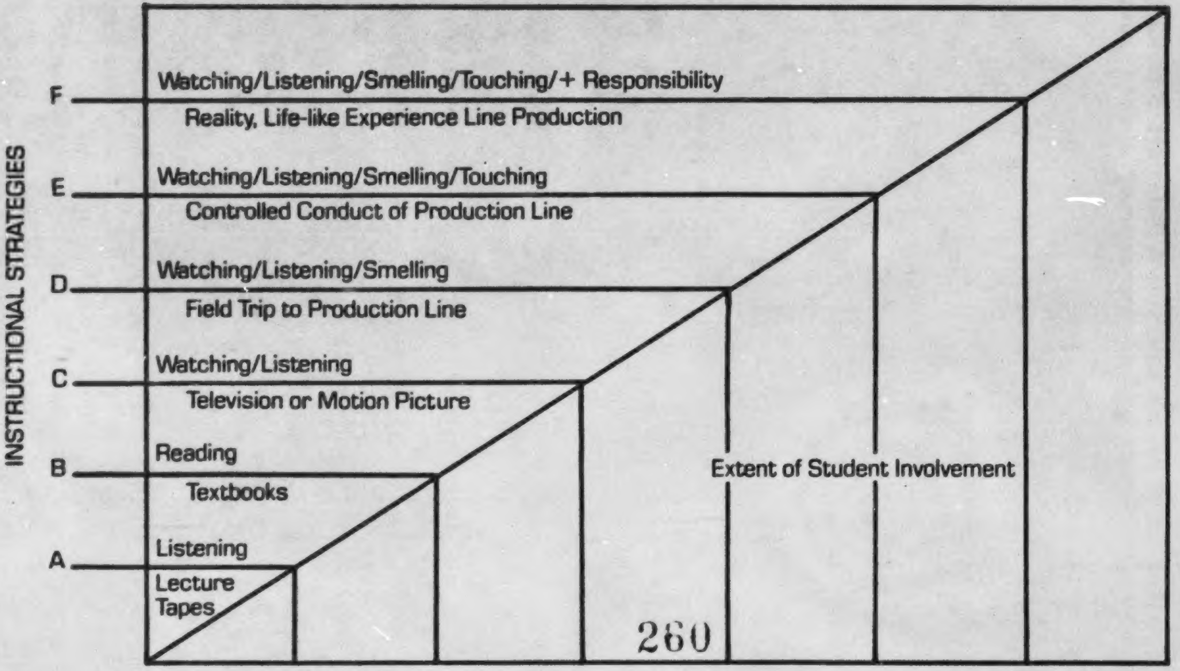
Strategy C: watching/listening involvement. Students observe and hear a television or motion picture presentation of a production line in operation as a component of a major industry.

Strategy D: watching/listening/smelling. Students visit an industry to observe a production line in operation.

Strategy F: watching/listening/smelling/touching/plus having responsibilities. Students are involved in a line production experience with major responsibility for leadership, finance, design, organization, production, sales, packaging, distribution, and financial accounting.

Now, let us take one more look at this range of involvement strategies as they are depicted on a graph with special reference to the factors in the learning process strategies and the levels of involvement of the person in the various procedures (see Figure 14-3). As the instructional strategies move from A to F, it is quite apparent that the whole person has increased his or her involvement in the

Figure 14–3
Learning—Involvement Model Associated with Teaching Industrial Arts Using a Program Component of Line Production—Enterprise.


INSTRUCTIONAL STRATEGIES
F
Watching/Listening/Smelling/Touching/+ Responsibility
Reality, Life-like Experience Line Production
E
Watching/Listening/Smelling/Touching
Controlled Conduct of Production Line
D
Watching/Listening/Smelling
Field Trip to Production Line
C
Watching/Listening
Television or Motion Picture
B
Reading
Textbooks
A
Listening
Lecture Tapes
Extent of Student Involvement

process of learning about line production in contemporary industry. It is also important to note that the more contemporary forms of industrial arts function at the level of strategy F but are supported by strategies A, B, C, and D.

As a capstone to this particular point or concern in the development of strategies for involving the total person, let us look at the particular dimensions of the individual that are or may be involved in such an experience. (A, B, C, D, F)

Sensory System Involvement
Actual use: seeing, hearing, smelling, touching
Possible use: tasting (dependent on product produced)

Intellectual Function Involvement
Creating
Assimilating
Analyzing
Perceiving

Psychomotor Function Involvement
Fine muscle motor control
Large muscle control
Physical control and coordination

Personal Factor Involvement
Pursuit of interests and likes
Development and expression of attitudes
Pursuit of aspirations and curiosities
Use of motivations
Expression of emotions, values, satisfactions, cares and concerns

Integrated Activities Associated With Above Categories
Decisioning
Valuing
Solving
Creating
Communicating
Exploring
Adapting
Leading
Following
Planning
Constructing
Evaluating

Developmental Task Involvement
Examples:

1. *Independence from adults:* Students make decisions about products to be produced.
2. *Accepting one's self:* The student is recognized for work performed.
3. *Shifting peer code:* The students establish standards for the product, work performance, quality control, and so on.
4. *Learning one's role in heterosexual relationships:* The student works effectively with persons of the opposite sex in decision-making and job assignments.

5. *Controlling and use of new body:* The student engages in physical motor activities such as planing, sawing, drawing, assembling, and drilling.
6. *Using language involving complex concepts:* The student draws up a set of safety rules.
7. *Moving from the concrete to the abstract:* The student discusses the meaning of interchangeable parts, mass production, and company financing as a result of involvement in each.

This has been a brief outline of a total involvement design in which the whole person has been a participant in the educational process. It has potential for involvement of the intellectual, personal-emotional, psychomotor, and sensory system as well as the developmental tasks at the student's level. The logic behind this discussion grows out of the holistic nature of the human and the reality of how he or she functions. This point is poignantly made by Pikunas (1969).

> Man is not merely a social being, an emotional creature, an intellectual entity—he is all of these and more all at the same time. His social interaction with others cannot be isolated from his feelings or intellectual functions, or from the multitude of other components which make him what he is. These powers do not merely converge in his person, they fuse with each other to a significant extent. He acts as a unified whole. (p. 8)

The concept of wholeness for the industrial arts teacher includes the additional dimension of the physical involvement to the social, emotional, and intellectual fusion from which an additional measure of the whole person emerges.

It is important to remind the industrial arts profession that an overemphasis on the physical motor functions without equal concern for the social, emotional, and intellectual will leave it with neither acceptance or effectiveness. The industrial arts teacher has within his or her grasp an organismic, total-person involvement process for teaching that has few parallels in academic practice. This total-person potential for education involvement is, in fact, one of the great strengths of industrial arts that can be exploited in practice at all levels in the school.

Industrial arts does, in fact, fulfill the commitment to the promise that "industrial arts puts the whole student in the school." Following are some ways in which this effort is facilitated:

1. Teacher education programs in industrial arts emphasize the importance of the many human connections associated with optimum learning experiences.

2. The programs in industrial arts provide for the flexibility conducive to a vast range of potential experiences that extend into the broadest involvement of the learner.
3. The processes of educational dissection that permit or encourage the separation of the manual or physical involvement from the intellectual or from the personal-emotional are not a part of the current thinking in industrial arts.
4. The nature of human functioning and how the individual achieves his or her optimum as an integrated system are common to the effective teacher of industrial arts.
5. Industrial arts emphasizes the activity-centered experience that has relevance to the education of the whole person.

SUMMARY

The degree to which the whole person experiences optimally in the industrial arts program in large measure depends on two important factors. They are the *program* and the *teacher*. The program in industrial arts provides for the dimension of wholeness of human involvement within a general framework. It is the skeleton of the body of educational experiences upon which a vast array or kinds of human involvement can be the tissue, muscle, and substance of the completed form.

Yet, the key to the proposition or concern for wholeness in the human's experience in industrial arts or any other subject area is the teacher. The intellectual vitality of industrial arts or any other subject field does not reside in a name, a tradition, or an expensive series of volumes. It is largely in the imagination, the ingenuity, and the perspective of the teacher.

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